RAILROAD GAZETTE

FRIDAY, FEB. 20.

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## Contributions.

### The Wear of Locomotive Tires.

*Chicago, Milwaukee & St. Paul Railway Co., Office of Superintendent of Motive Power,* WEST MILWAUKEE, Feb. 13, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note your review of my article on "Irregular Wear of Locomotive Tire" in your issue of Feb. 6, 1891, and must say that I am somewhat surprised that you should raise the question as to whether the inertia of the reciprocating parts was taken into consideration. With the data given in the paper the writer could very readily ascertain whether this was so or not. For the sake of brevity I omitted the figuring which would have made the paper uselessly cumbersome and which can be found in dozens of elementary works on the steam engine. If the consideration of this important matter had been omitted in the calculation, then it would, of course, vitiate the whole result and the paper would be absolutely worthless.

I feel that this is a very severe criticism on the merits of the paper, and is wholly uncalled for, as the data as to the weight of the reciprocating parts has been carefully given, and ten minutes' calculation would have demonstrated whether this very important factor was taken into consideration or not.

There is a possibility of slight errors in the figures which may arise either from calculation or from copying and printing, but there is no discrepancy which can arise from neglect of the reciprocating parts.

J. N. BARR.

### Guard Rails on Bridge Structures.

ST. PAUL, Minn., Feb. 10, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reading Mr. Schenck's article on "Guard Rails for Bridges" in the issue of the 6th inst., I notice one feature in the design to which it seems to me an emphatic protest should be made, namely, the close proximity of the inner guard rail points and re-railing device to the end of structure.

Such devices as shown on the plan may do all that is expected of them in case of a derailment with moderate speed of train, but where the speed is 25 or more miles per hour, and the derailed wheels very far from the track rails, it is doubtful if the arrangement could be depended upon for success in every case. If the device fails to turn the derailed wheels the result will be a *wreck upon the structure.* Why not remove the re-railers and their accessory outer timber guards and inner guard rail point far enough from the end of the bridge, say 150 ft., so that in the event of their failing to do the work expected of them the wreck will occur *on the bank* rather than on the bridge? It will cost but little more to do this, and in some instances might save the cost of a new bridge.

This same argument holds if only inner guard rails are used without re-railing device and outer guard timbers.

CHAS. F. LOWETH.

### The Second Expert Report on the Brooklyn Bridge.

NEW YORK, Feb. 11, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As you state in your last issue that a correspondent who signs himself "Dot" "shows in a simple manner which may be followed by any one" that certain conclusions which were expressed in the journal of which I am one of the editors were incorrect, and as you further go on to refer to myself as an individual in your comments, correctly stating that I have myself prepared and submitted for consideration plans for the bridge termini, and adding, "We are compelled to believe that prejudice has led him to consider them [the bridge plans] chiefly from the side of his own scheme," permit me to state:

1. The methods of handling the traffic which "Dot" declares to be "the methods which the Board [of Experts] proposes to employ" propose to accomplish not one only, but two different and distinct physical impossibilities, viz.:

(a) They propose to switch trains back from the incoming platform to the stub switch in 30 seconds, when Mr. Leverich himself shows (p. 27 of his pamphlet, "Traffic Capacity of Brooklyn Bridge") that this operation requires in practice an average of 48.8 seconds, varying in 20 successive observations between the wide limits of 45 seconds as a minimum and 63 seconds as a maximum. These limits I have this week ascertained by still more extended time observations to be substantially correct, and it is this limit which fixes and controls the headway of trains, which has never been reduced successfully below 85 to 90 seconds. The total time allowed for the whole movement of the train from entrance to departure is only 120 seconds, whereas the table above referred to shows that 176.1 seconds (varying in 20 successive trips from 161 to 194 seconds) is now required to work even a single system.

(b) They propose the further impossibility that two trains shall occupy the same space at the same time, the rear car of train *B* running out to the stub, and the head car of train *A* backing down from the stub to the outgoing platform, coming into collision every 90 seconds, even if on time to the second.

Permit me to state further:

2. The diagrams of Mr. Leverich, to which you refer in the same connection as if showing the same system of handling the trains as that announced by "Dot," are based upon an entirely different schedule, allowing 195 seconds for the total movement for which "Dot" allows only 120 seconds, and they propose to accomplish two other and entirely distinct physical impossibilities, which are of such a nature to make it clear that the necessary allowances of time for the movements of the *B* switch engine (marked *Y* in your diagram published last week) was wholly overlooked, viz.:

(a) The schedule requires that the *B* engine shall be in two different places doing two different things at one and the same time, viz.: at the rear (west end) of train $B^1$, kicking it back to the outgoing platform, and at the front (east end) of train $B^1$, running over the crossing to couple on to train $B^2$.

(b) The schedule further requires, even if this miracle were performed, that the trains, the process of unloading, and the movements of the switch engine, shall be all on time to the second, or collision will result; and even if so on time, the engine must be in motion toward the crossing before train *A* has cleared it.

These facts you will discover by carefully going over the movements of the trains on the respective schedules, guided by this statement of the specific points of difficulty; or if not, you will find them pointed out in detail in the forthcoming issue of *Engineering News*, by the aid of the graphical methods which you justly state I am accustomed to use.

A. M. WELLINGTON.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In *Engineering News* of Feb. 14 Mr. Wellington prints a rejoinder to my letter to you of Feb. 6, in which he states at length a difference between us which can be decided only by actual determination of the fact; that is to say, whether the trains can be handled in the time which I have allowed for them, or whether they will require the longer interval which he considers necessary. Having witnessed and timed the easy and regular movements of the trains with the present arrangements, and having found them, when active movements were required, to occupy less than the time allowed in my calculations, I have no doubt of their correctness.

DOT.

### Influence of Trainmen's Brotherhoods.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I was glad to see the letter of "General Manager" in your issue of Feb. 13 on the above matter. It is high time that railroad managements speak out, even if the subject be a delicate one. They must do something besides compromise with employés' committees. Staving off a contest is very different from fighting it out.

It is well enough for men to combine, and to select their cheekiest fellow as a committeeman to press for the highest wages possible, provided they will actually hold him down to the functions of a committeeman and not let him become dictator. Managers have to waste much valuable time in pounding common sense into these men's heads, but in conformity to "American ideas" we can submit to that. But committeemen are not thus held to their duties.

The so-called leaders should fulfill two functions. First, they should promote the interests of the men, in their dealings with careless or penurious managers and with unprincipled or rough subordinate officers. It must be admitted that there are such officers and managers, and that the well-managed and badly-managed roads must suffer alike in consequence. A "leader" should faithfully work for his constituents as against all injustice. On the other hand, the "labor leader" should be a counselor to the men themselves. All must admit that trainmen and engineers have their faults, and that they are frequently glaring ones. These men need restraint in many ways, just as much as they need guidance in aggressive movements. One of the "Grand Masters" in the switchmen's strike at Chicago a few months ago gave his constituents a severe lecture for starting a foolish strike. It will be remembered that at Pittsburgh recently some men who struck were expelled from their "order" for hasty action, which was unjust to their associates. These officers, the one who reprimanded at Chicago and the one who expelled at Pittsburgh, did their simple duty. They did their associates a far better service than is done by those leaders who simply back up every strike that is started. Every one knows that the strength of the head of the brotherhood of enginemen is based on his skill in holding back his impetuous men from foolish strikes.

"General Manager" speaks of the harmful activity of the leaders of employés' organizations. Any manager can corroborate this. The most significant fact in connection with the late "demand" for higher pay on the Erie road was that the men who made the demand, ostensibly for all the employés of the company in train service, really had no general authority whatever. On the surface it seemed to be a quickly organized coalition between the engineers', the firemen's, the conductors' and the brakemen's brotherhoods, and people wondered that such a perfect "combine" could be effected with so little noise; but in point of fact there was no agreement whatever that amounted to anything. A few agitators (perhaps not the worst of the class designated by that name but still coming fairly within it) got a following of those few of their associates who were of their own kidney, and went ahead. The attitude of the great mass of the men was really neutral. They knew that the demands made would undoubtedly be shown to be more than the company could grant and so did not back them; but at the same time they felt as would be the case with any similar body of men, a natural friendliness for *any* movement, whether absolutely just or slightly shaded with unfairness, looking to the increase of their pay, and they therefore refrained from protesting against the unauthorized use of their names.

The New York Central strike was not much better. The men faithfully obeyed their local leader, Lee, even though he acted from short-sighted, narrow motives, based chiefly on selfish considerations personal to himself; but it turned out that Lee acted against the advice of the higher officers of his organization. While in the Erie case we see the paradox of a leader without followers, in this we have followers who have no intelligent conception of what or whom they are following. So much for the difference between actual and spurious leadership.

Your correspondent also spoke of the theoretical and the actual "sobriety" of the Engineers' Brotherhood. That statement is readily confirmed. In a long experience in dealing with these men I never knew one engineer to report another for drunkenness, and yet it stands to reason that many cases of drunkenness on engines have been known to brother engineers before they got found out at headquarters, and the tenets of the organization require members to work faithfully for the highest interests of the companies and the public.

The present situation and tendency may be summed up in the statement that employés are surely drifting into a condition of mind where each man thinks it easier and safer to depend upon the power of his organization to patch up his reputation (and his material interests) whenever he causes a wreck, imperils lives or commits a breach of his contract, than it is to depend upon his own individual efforts. He takes the lazy course instead of the sensible and reasonable one of doing his plain duty, which is to perfect himself as a good workman so as to have few blunders to trouble his superiors, and to make such a good record that whenever he does make a mistake the record will help him out. The Brotherhood idea is well enough in theory, and it is true that it brings the men together on a level. But it is always a lower level. I have seen plenty of cases where the more intelligent and reliable men of a brotherhood would shoulder the responsibility of an incompetent man's misconduct, but I have never seen any evidence that they did anything to improve his efficiency.

C. H. B.

### Eliminating the Possibility of Accidents.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your remarks on Mr. Acworth's letter under above heading are to the point [*Railroad Gazette*, Dec. 26, 1890].

No information is to hand on the following question, but I should certainly like to ask in respect to the relative cost of English and American railroads whether it is not true that the tonnage over a thousand dollars' worth of English track is not many times the tonnage over a thousand dollars' worth of American track. If this be so, then the cost of the two systems may be not far different, if indeed the ratio be not reversed.

In Great Britain, etc., I suppose there is a mileage of about a sixth the American mileage and a population of about two-thirds. The trade of 40 million people is carried upon one-sixth the mileage of the trade of 60

millions, simply because of concentration, and the English lines do not pay as well as they should for other reasons than initial cost. At the same time it must not be overlooked that on all the principal English lines the charges for both goods and passengers could be reduced from 16 to 45 per cent., and yet the lines could pay 4 per cent. on capital; following being a few of to-day's prices of £100 stock of a few lines: 161, 163, 178, 147, 166, 124.

Now, it is in the carriage of goods that English charges are relatively so high. Passenger rates are less all round than American rates, as any time book will show; but even here they might be less, for the passenger mileage per mile of track is very great. Doubtless the cost of passenger traffic is enhanced by the frequent service. No American line gives anything near the local service between neighboring cities such as is provided here.

However, passing that over, let us take a view of the freight service. We find here that, while all attention has been paid to passenger vehicles, the best of which are now carried on a pair of six-wheel trucks (bogies we call them), no change has been made for years in freight cars. They are short, four-wheel concerns, exactly as I remember them thirty years ago, and no doubt before that time.

It may be contended that the rigid wheel base of these trucks is no greater for the easy curves of our lines than is the wheel base of an American diamond freight truck for the sharp curves of America. The question of resistance is not a question of wheel base ratio to curve of line, but something quite different. Watch a train of short cars traveling. Every car is "*nosing*" continually from side to side, and this simply means that its leading wheels are alternately hugging one and the other rail. Think of the enormous flange grinding which all this implies and the shaking up of the cars and consequent heavy charges for repairs.

It is an undoubted fact that a large portion of English freight traffic could very well be carried on longer and larger trucks of better paying load capacity, and some saving might be effected. At the same time it seems reasonable to suppose that were English railways worked on the American plan of running full vehicles and fewer trains the cost of operating would be less. It is very largely a question of service. The public calls for a certain standard and has to pay for it. Terminal expenses, too, cannot fairly be left out of the reckoning. It costs just as much to load and unload a car for a 10-mile as for a 1,000-mile journey, and yet the terminal charge is spread over more miles in one case, and so is less per mile.

I think Mr. Acworth overlooks the crowded state of the lines here when he doubts the value of protective measures. It is easy to laugh at the hard and fast rule being applied in the Scottish Highlands, but it would not be so easy to work a traffic of English density over every American line, and American engineers are bringing up their protecting facilities into line with traffic density as fast as they can, and wisely, too. The 3 to 1 ratio of safety has been attained in face of the density of traffic tending to an opposite ratio.

It is open to doubt, of course, whether English railways need be so crowded. At or near 5 and 10 a. m., 12 noon and 2, 4 and 5 p. m., there are, for example, three fast express trains between London and Manchester by three distinct routes, besides others at other hours between. In almost all these trains some compartments will be empty, or half filled only; and as regards the Manchester traffic, it could be served better by a smaller total number of trains at shorter intervals of time, instead of by the present number running three abreast. The same remarks apply to other towns. As each of these trains, however, calls by the way at two or more places, these would seem to present a difficulty, and it may even be claimed that no fewer trains could well be made to meet the country's wants.

As to freight traffic, it is a difficult matter to give dispatch with economy, but so far as an individual case is of value, I may say that most of the freight which concerns me would be, perhaps, better stored in a long car than a short one, and that expedition and quick delivery is so well worth money that hardly a day passes that some piece of iron or steel is not sent by fast passenger train rather than by the daily freight. Now, though stuff in bulk may form over 70 per cent. of English freight, it is the other less than 30 per cent. made up of so infinite a variety of articles that has to be dealt with at terminals. Coal takes care of itself and is run down chutes by the ton, but you cannot dump a miscellaneous cargo. At the same time, there is a leak somewhere which sends up charges. It is not at any one point, and so is hard to locate.

Even if freight cars ran without hauling, the question would still exist in scarcely diminished intensity. No one seems able to give a good explanation, though many offer ideas, often based on suppositions which figures will at once disprove. W. H. Booth.

[The total mileage of English railroads is nearer one-eighth than one-sixth that of the American roads. Jan. 1, 1890, there were in Great Britain and Ireland 19,943 miles of railroad, and in the United States there were 161,397. But only one-half as much freight *per capita* is carried in England as compared with the United States, and that freight is carried for much shorter distances; so that the English freight movement, instead of being many times greater per thousand dollars' worth of track, is, as we elsewhere explain, decidedly less than the American.—Editor Railroad Gazette.]

## Some Possible Economies.

Chicago, Feb. 7, 1891.

To the Editor of the Railroad Gazette:

One of the hopeful features of the Western Traffic Association now being organized is the attitude its promoters have taken in the direction of reducing operating expenses, as well as the agreement looking toward the better maintenance of rates and the abolition of all useless free transportation. There are a number of directions in which, if the pressure of remorseless competition were removed, the roads would be able to cut off expenses which do not seem necessary of themselves, but have to be kept up because all the rest do so.

What a large direct loss of revenue would be stopped if the evil of ticket commissions could be abolished! We are wont to criticise the waiter at a restaurant or the porter on a sleeping car who expects to make a large part of his living from "tips" derived from the public, but the average railroad manager seems to have discovered nothing wrong in the principle which allows an employé to work for a certain salary, which is supposed to be a full equivalent for his services, and yet accept from outsiders commissions which may reach a larger sum than the regular salary which he draws from his employer. This is just as demoralizing as the same would be in other branches of the service. Millions of dollars could be saved annually by dropping the absurd practice of paying foreign agents for remaining neutral. Exact figures are hard to get because rates are variable and because the money sometimes comes out of earnings and sometimes is included in general expenses or expenses of agencies. It is safe to say that the direct commissions run from $100,000 to $300,000 on any trunk line east or west which pays them. The Pennsylvania is supposed not to pay or allow them to be received to any extent; but this is the only road that can be counted as a positive exception.

If a further step can be reached and a general simplification of the whole outside agency system be accomplished another source of expense will be much reduced. In the rural districts and in the smaller towns all agents of this nature could be abolished, with probably a net gain to each road, as carefully prepared statistics indicate that the loss to a road of a gross revenue from the abandonment of any such offices or agents would, *in almost every case*, be less than the money directly saved by such abandonment.

If we could go a step further and concentrate the few agencies that are finally decided upon as necessary at the larger cities, under the control of the Traffic Association, another saving could be effected, as one central agency in each city, whose officers and agents would be perfectly neutral as between the various lines, would meet all the needs of the roads and the public as well. This plan was in successful operation for a number of years with the Omaha office of the Chicago-Omaha roads, and could be easily put into operation generally. An average agency at a large city costs from $3,000 to $15,000 per year, and it requires the profit on a good many tickets to pay these sums. Our large roads have from five to fifteen outside offices, and the total soon counts up to an astonishing figure. The fact is that local non-competitive traffic has to be severely bled to keep up this poor paying, often non-paying, business that is fought for.

"Printing and advertising" needs also to be looked after. This is a drain which would continue unnecessarily large, even if outside offices were closed, unless care were exercised. The sums expended to keep a large road well advertised by maps and literature of various kinds, over the territory outside of its own line, reach considerable amounts, and necessitate more or less traveling on the part of agents who have to keep the different stations, brokers' offices and hotels supplied with information for the benefit of the public.

The following figures are taken from annual reports:

| | Expense per year. | | |
|---|---|---|---|
| | Printing and advertising. | Foreign agencies. | Total. |
| C., M. & St. P. | $219,178 | $57,126 | $276,304 |
| C., R. I. & P. | ..... | ..... | 710,745 |
| C. & N. W. | 286,616 | 204,972 | 490,988 |
| A., T. & S. F. | 210,946 | 293,857 | 504,803 |

Under printing and advertising of course a large portion is necessary, but who will say that if the reforms proposed were carried out one-half of the printing and advertising and two-thirds of the foreign agencies could not be done away with?

By having each line give in its folders, etc., a little more information than it now does about the time made by its principal connections, all the information really needed by passengers would be furnished, and at a less net cost to each road. As it is, all the folders of any road contain more or less information of this kind, and there is a needless duplication in consequence. This would have the result, also, of reducing the expensive character of a great deal of railroad printing and advertising, which is now so profuse in ornamentation and lavish in quantity. The multitude of elaborately illuminated calendars, illustrated guide books, and glazed and framed display cards, in many cases bring in but a small actual return in traffic for the amount expended.

Another economy which would be possible is the abolition to a greater or less extent of the dining-car system While in many ways a convenience, it is usually a material cause of expense, not only in the usual loss in operating the commissary part of the service, but also from the considerable sum involved in hauling the cars, and for repairs, which are quite expensive. The loss per year per car on cars charging 75 cents a meal and getting only two meals a day is from $2,000 to $3,000. Where three meals a day are served the cars probably would about pay running expenses, but it is seldom that this can be done. The cars on trunk lines east of Chicago, which charge $1 a meal, or by card, probably come out even, but the accounts are in most instances unfairly kept, the cost of hauling and of repairs being concealed after the ostrich plan. The cost of repairs on a dining car, not included in the above profit and loss, will average $2,000 per year, including depreciation. This last is large, as the plant would represent $20,000 per car on an average. As our principal Western roads have from one to ten dining cars each, it requires very little figuring to show a loss of $50,000 to $100,000 in a year on one road. If union among the roads could be effected in this direction, these cars could be eliminated from the majority of trains. The dining car could be retained on limited trains, where an extra amount is paid for passage to cover the extra cost, and it is on such trains only that they are really needed.

These few figures should be "food for thought" for a good many railroad men. General managers, unless they are willfully blind, know them by heart already. But many a higher officer and many a lower one has a responsibility in the matter which would be better fulfilled if these important questions of economy occupied a more definite place in their minds. Economy.

## The Barber Roller Bearing Truck.

There has been much recent discussion on swing motion and rigid trucks. The following description of the Barber truck will be found timely by those who have taken an interest in the subject. It is one of the best designs of lateral motion truck, without swing links, and is simple, inexpensive and easily maintained. Its construction is clearly shown in the engravings. The side frames do not differ materially from the ordinary diamond truck. The truck transoms are attached to the side frames in the ordinary manner by bolts passing through malleable iron, bolster guide bars. To these guide bars the transoms are riveted with ¾-in. rivets, as shown in detail in fig. 5. The swing bolster is made of a 12 in. channel, trussed with two 1⅛-in. truss rods, as shown in fig. 3. On the ends of the lateral motion bolster are riveted bearings which move on rollers, shown in fig. 3, two of which are placed at each end. The surfaces on which the rollers move are cylindrical and concave toward the rollers; therefore, when the truck is displaced laterally, it has a strong tendency to return to a central position.

One of the most interesting features of this truck is the location of the springs directly between the arch bars. There is a spring seat on the lower bar which receives the springs, and a spring pocket above which is guided by the vertical guide bars by means of lugs working in the slot *A*, fig. 5. On top of this upper spring pocket are placed the bearings for the rollers. The bearing surfaces are chilled, and the rollers are made of steel, 2½ in. in diameter and 9 in. long.

This truck has been in use for considerable time on the Northern Pacific, and is the invention of Mr. J. C. Barber, M. C. B., Northern Pacific Railroad, St. Paul, Minn. It has been developed by actual service, and as the design is now presented it embodies the results of actual experience, and is believed to be in a very satisfactory and serviceable form. Certainly the design has considerable merit and many advantages over the swing-beam truck, perhaps the most important one being that there is an initial resistance to a lateral motion, a most essential feature for a swing truck, to prevent oscillation of the cars. In this respect this design is very good, and its simplicity, durability and good mechanical design further recommend it.

The grooves for the rollers were first made very deep, in proportion to the width, but it was found that when the weight of the loaded car was on them the car was lifted so much when pushed laterally that the lateral resistance was too great. Now they are made ⅜ in. deep and 5 in. broad, and the cars are given 1 in. lateral motion each way. This is just sufficient to give a satisfactory cushion. On a test made with six refrigerator cars loaded with 80,000 lbs. of car wheels each, the cars weighing 38,500 lbs. total, at 66 miles per hour the steadiness was remarkable, and the cars were more comfortable to ride upon than either the locomotive or tender, and in every respect superior to the ordinary swing beam or rigid truck.

In some cases where these cars have been in use for a long time it is shown that the stops on the ends of the swing beams have never touched the ends, thus showing that for all ordinary curvatures the grooved seat for the rollers is just about the right curvature to prevent the cars from thumping laterally, and the bolster does not strike hard against the sides of the truck.

In order to determine the durability of these trucks, 100 refrigerator cars were put into service, with orders not to repair them in any way nor tighten up the bolts without special orders. After three years' service they are found to be in good condition, not re-

Fig. 1.

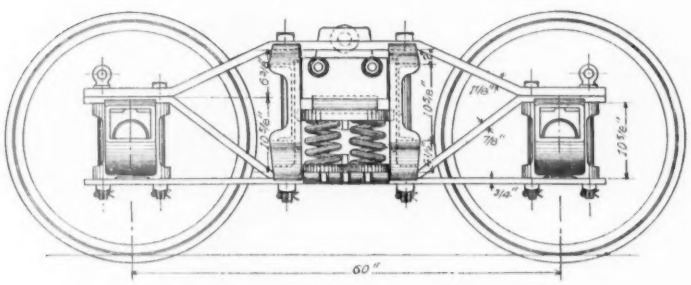



Fig. 2.

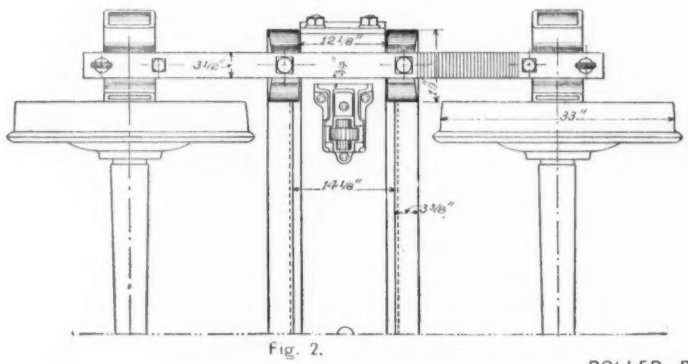



Fig. 3.

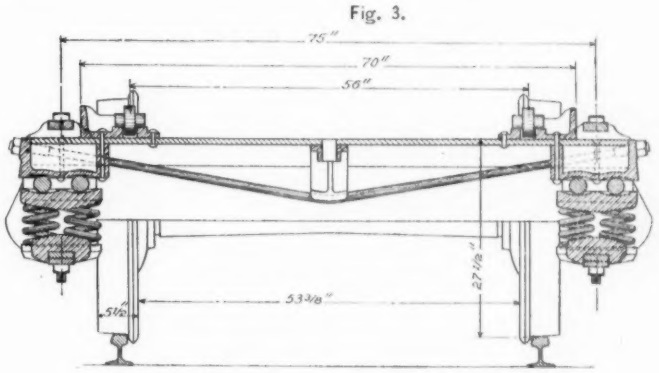
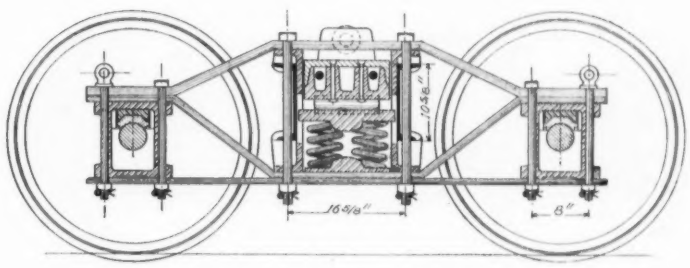



Fig. 4.




ROLLER BEARING TRUCK.

*By* MR. J. C. BARBER, M. C. B. *Northern Pacific Railroad.*

quiring repairs. The riding of these trucks is so satisfactory that they are now being put under locomotive tenders.

It will be readily seen that there is a greater saving in weight as well as in the number of parts; something more than 58 prominent parts being removed per car, without counting rivets, bolts, or nuts; including these, the number is over 100. This is not surprising to any one who will inspect the cuts and make a comparison of this and the ordinary construction.

## Payment for Tunnel Quantities Outside of the Standard Outline.

In the contests between companies and contractors about payment for extra-outline quantities where the price is per cubic yard, two ideas appear prominently in the company's case. One is that the contractor willfully increases the tunnel quantities, and therefore should not be paid for the increase. The other is that the extra-outline material falls in of itself, and should, if paid for at all, be paid for at a less price than that for the regular tunnel quantities. There are many grounds, however, for the belief that this extra-outline material is seldom brought in intentionally by the contractor, and for the further belief that, however brought in, it is more expensive than normal tunnel quantities, rather than less expensive. Some examination of the questions at issue can be made under three different headings:

1. Material from outside the standard outline which is supposed to fall, from the nature of the material, and necessarily has to be removed. Payment for this is sometimes either refused altogether or is granted at a lower rate. In actual practice, insecure extra-outline material does not often so fall; only a very small percentage drops within the outline without labor expended upon it. It simply remains suspended in an insecure state, requiring actual work on the contractor's part to get it ready for the muckers to remove. Any one who has watched the efforts of the miners to bar out or otherwise work out what are apparently and in reality very threatening masses will appreciate the force and labor required to dislodge such masses. In general such threatening material is roof material. Much that could be safely left in the walls cannot be left in the roof. In one case of 2,200 ft. lineal of rock tunnel, out of 9,000 cubic yards of extra-outline material, almost the whole was from enlargements above the spring line. Such unsupported insecure material in the roof, it may safely be said, costs nearly double the regular tunnel material, for several reasons. It must be worked out at much greater risk, and in a way that is awkward, requiring much more labor per cubic yard. Such overhead material, even if not taken out at a risk to the workmen, would cost more. The drillers working at a disadvantage and risk will not accomplish 50 per cent. in any given time of what they would in straight-ahead work; even if indifferent to danger, they will work much more slowly. The material to be removed, being generally from pockets in the roof, is not accessible from the sides to any great extent. Removal of it is practically doing the expensive work of running a heading, with the added disadvantages that it is a heading run upwards vertically, and that the material is ready to fall on the workers. The force of gravity opposes instead of assists the hammer work, making the work of striking an entirely different affair. The drill has to be lifted as well as held in position. The loading of the holes is difficult. The holes have to be different in character and position and less effective, and less economical of powder. The insecurity of the roof not being known, of course, until after the heading has passed it, the insecure material is largely out of reach except by temporary staging. Much of the insecure roof material cannot without stoppage of the bench work be attended to until after the bench, as well as the heading has passed it, necessitating high staging, upon which the men cannot work readily, and up to which it is difficult to pass tools and materials. This staging is in the way of the cars from the work ahead, and of the material to be brought down from the roof. In fact, such extra-outline work belongs less to rock tunnel work than to the more expensive soft tunneling in difficult ground, supported work. Therefore, in tunnel work paid for by the cubic yard, necessary extra-outline work should not only be paid for, but should be paid for at the full price, at least, of the regular tunnel quantities.

2. Another class of extra-outline material is that which, not naturally insecure, is intentionally made so by the contractor, in order to increase his work. From what has been said, it is evident that a contractor is not apt to seek such increase by raising the roof. If any needless insecurity and consequent enlargement is made, it will be in the side walls. For reasons given below, it is not often a profitable arrangement. Where it can be shown to be intentional, the payment for the extra material should be promptly disallowed.

3. A third class of extra-outline material is that done in secure rock, and then claimed to have been necessary. This also should be disallowed, whether in roof or bench. It is difficult to decide in many cases whether the necessity has existed, especially for an engineer not constantly on the ground. Therefore, as in case No. 1, an investigation of the probabilities and probable comparative expensiveness should be made to assist in the determination. Let us suppose a case in secure rock. The tunnel outline being as per fig. 1, and the heading run as per fig. 2; the holes *A* and *B*, cut holes, inclined toward each other; the outline holes *C H J I F* being started 12 in. from the outline and inclined to it, and the holes blown in the order *A B, C D E F, G, H I*, and lastly *J*. For extra-outline material *C, H, J, I* and *F* are the only holes to be considered. To start an intentional enlargement from a section that is normal, either the drills must be started close to the outline—an inconvenient arrangement even with the single striker—or the drill must be inclined at a very great angle from the direction of the tunnel. In the latter case the striker interferes with the strikers in the centre; in roof holes the striking must be upward much more than usual; all the holes must be much deeper to reach the same run forward that the centre drillers are making, and the holes will not blow as well.* Hence the process of enlargement itself is not a profitable one, even in the side walls; and if profit is to be gained in increased quantities and enlarged tunnel area, it is only in a long continuous run after the enlarged area has been reached and the drills resume their regular direction. Such a run of enlarged outline the engineer would readily note and check. An experienced contractor is not apt to hunt for profit in short enlargements and pockets. Hence the probability is that, with experienced contractors, the payment for extra-outline quantities will not include very much material needlessly taken out.

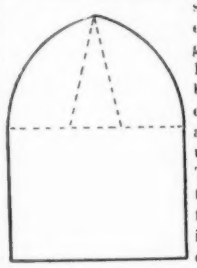


Fig. 1.

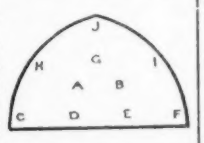



Fig. 2.

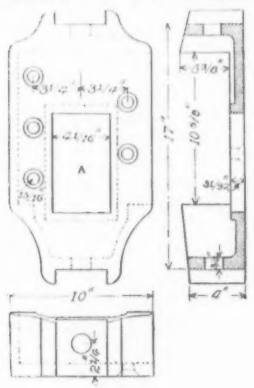



Fig. 5.

The miners, being an intelligent class of workers, generally take a pride in the appearance and outline of their work, and are not apt to go outside of it in a hunt for extra quantities for their employer. If points are set frequently by the engineer and the men kept well informed of the lines required, the most frequent cause of extra-outline quantities will be avoided; namely, that of the whole tunnel area running to one side. This operation is not a profitable one for a contractor, as it involves expensive slicing work on the scant side, and is not apt to be done for the sake of enlarging the yardage.

The plan of paying for tunnel work by the foot lineal is supposed to avoid all these extra-outline payments. It probably relieves the company's engineers of measurements and disputes about yardage, but does so by practically paying the contractor for more than all extra-outline quantities. The bid per foot lineal of every experienced contractor will include such probable extra-outline expense, and with a margin (to cover uncertainties) which he would not make if he could count on payment by the yard for all material necessarily removed, and the speculative element were removed from the bidding.

ARCHIBALD A. SCHENCK.

## Express Locomotive Class "B," Chicago, Milwaukee & St. Paul Railway.

The locomotive shown here is not large, but is doing a class of work which was formerly done by 18-in. engines. It is remarkable not for its power, but for the

*The above difficulties in the way of enlarging the heading apply largely to the bench, whether this be run by horizontal or vertical holes.

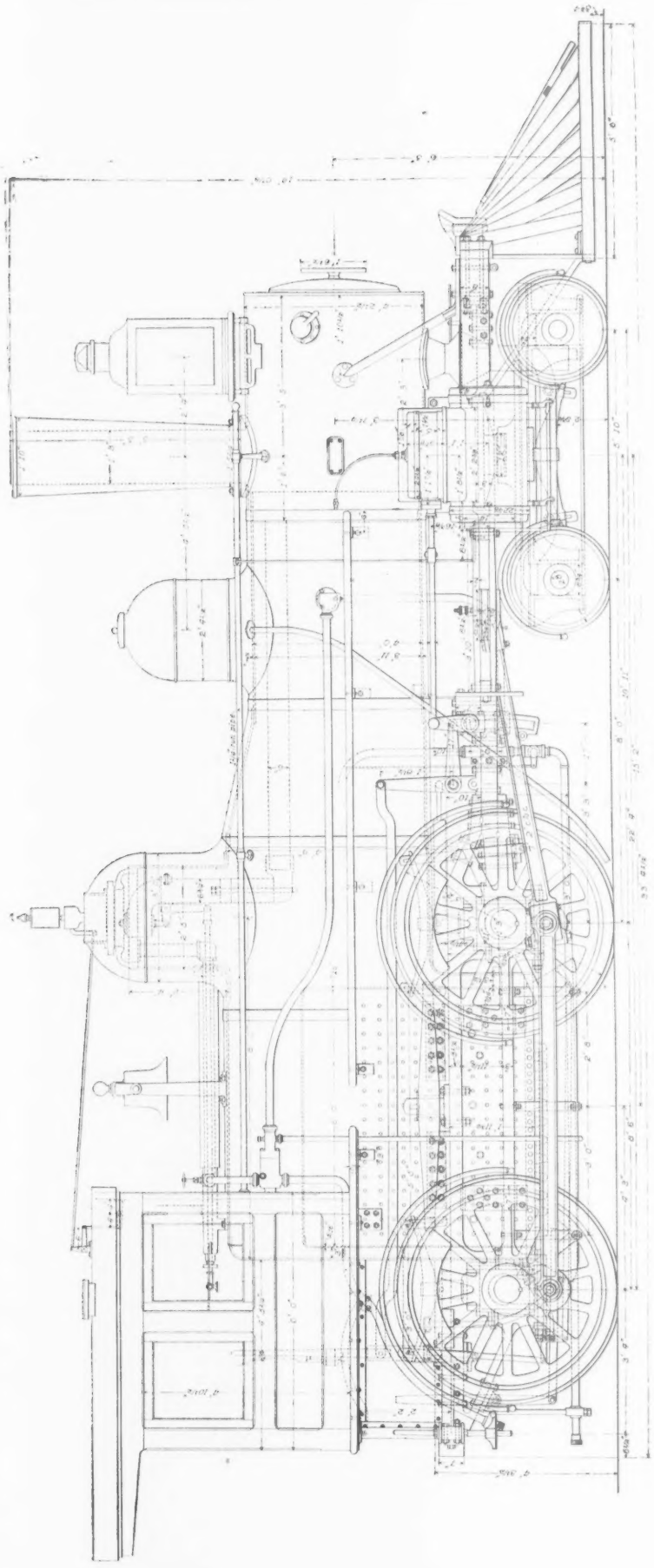


Fig. 1—Elevation.

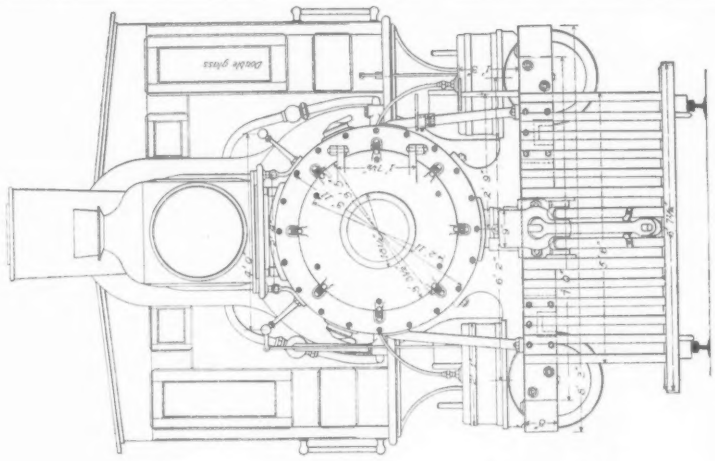


Fig. 2—Front End Elevation.

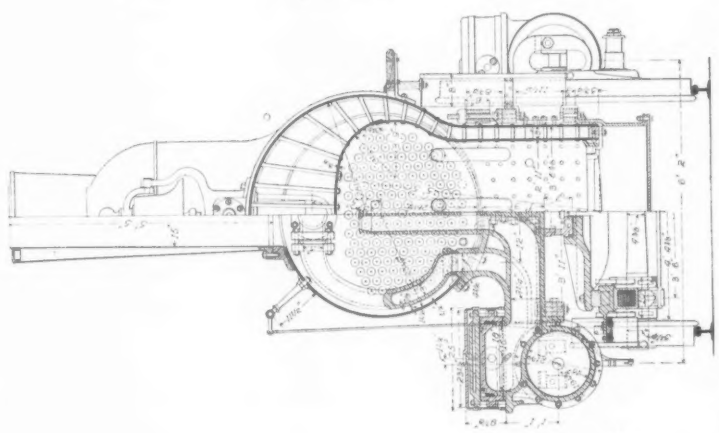


Fig. 3—Half Section through Cylinders and Firebox.

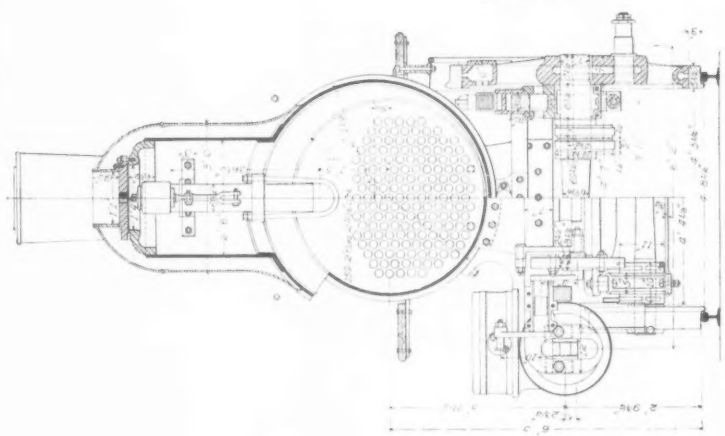


Fig. 4—Section through Link Motion.

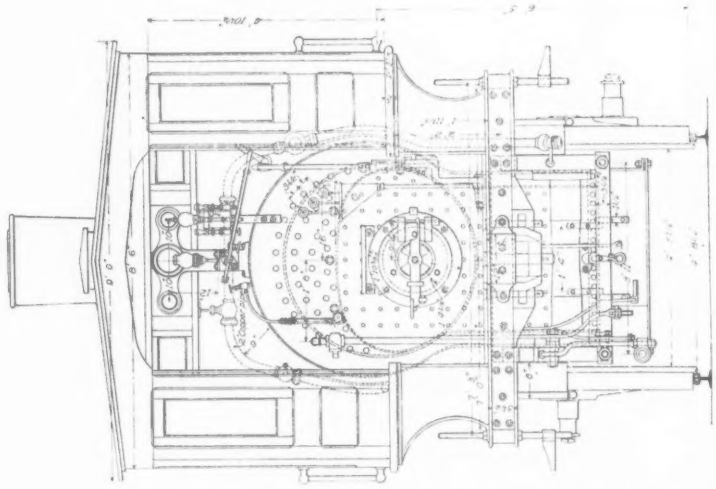


Fig. 5 -Back End Elevation.

16-IN. × 24-IN. EXPRESS LOCOMOTIVE. "CLASS B"—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

**excellence of its design. It may be taken as representing the light passenger engine of the most modern type. Attention has been called to this locomotive by reason of its excellent economy and rather surprising hauling capacity considering the weight on the drivers and the diameter of the cylinders. The following are the general dimensions :**

| | |
|---|---|
| Cylinders | 16 in. × 24 in. |
| Driving wheels | 5 ft. 2 in. dia. |
| Truck wheels | 30 in. dia. |
| Weight in working order | 86,000 lbs. |
| Weight on drivers | 54,000 lbs. |
| Weight on truck | 32,000 lbs. |
| Weight of tender loaded | 66,000 lbs. |
| Driving wheel base | 8 ft. 6 in. |
| Truck wheel base | 5 ft. 10 in. |
| Total wheel base, engine | 22 ft. 4 in. |
| Total wheel base, engine and tender | 44 ft. 10½ in. |
| Steam pressure | 160 lbs. per sq. in. |
| Boiler diameter | 48 in. |
| Boiler material, steel | ⅛ in. thick. |
| Fire box | 72 in. long, 35 in. wide, 65 in. deep. |
| Tubes (159) | 2 in. in diameter, 11 ft. long. |
| Boiler, radial stay, wagon top. | |
| Heating surface, tubes | 801 sq. ft. |
| Heating surface, fire box | 115 sq. ft. |
| Heating surface, total | 916 sq. ft. |
| Grate surface | 15.5 sq. ft. |
| Steam ports | 16 × ¼ in. |
| Exhaust ports | 16 × 2½ in. |
| Bridges | 1 in. wide. |
| Eccentric throw | 5 in. |
| Valve travel | 5½ in. |
| Outside lap | ⅞ in. |
| Inside lap | 0 in. |
| Driving axle journals | 7½ × 8¼ in. |
| Truck axle journals | 5¼ × 10 in. |
| Tender axle journals | 3¾ × 7 in. |
| Crank pin journals, main | 4½ × 4 in. |
| Crank pin journals, parallel | 4 × 3½ in. |
| Cross head wrist pin | 2¾ × 3¼ in. |
| Engine truck, rigid centre. | |
| Tank capacity, 32,000 gallons and five tons of coal. | |

This locomotive is of the ordinary 8-wheel type with radial stay, wagon top boiler. The dome is placed on an extension of the wagon top at a point where the boiler is circular in form, thus requiring no additional bracing. We shall refer in particular to several of the details of this engine. Among these will be mentioned the engine frame, fire brick arch supports, throttle connection, extension arch, cylinders, steam chests, driver brake arrangement, truck axle boxes and other details.

This engine presents a very pleasing appearance with the straight stack and smooth casings. Both the main rods and side rods are fluted; the main rod probably being the lightest ever constructed for this size of engine, and yet it has more than sufficient strength to perform any work that it may be called upon to do. The first engine built has run 70,000 miles up to date with a cost for repairs of 91 cents per 100 miles. The fire box has not received any repairs since the engine went into service, which speaks very well for the radial stay wagon top. There has been no difficulty in keeping the boiler free from mud and scale, which can hardly be said of either the crown bar or Belpaire design with the kind of water used on the

St. Paul road. The elevation, fig. 1, shows the general arrangement of the details, and gives some idea of the appearance of the engine. It will be noticed that the details are simple and symmetrically placed.

The steam space in proportion to the cylinder capacity is very great, as will be seen from the large amount of room in the wagon top. This may be more clearly seen, perhaps, from fig. 3, which is a half section through cylinder and fire box. The arrangement of tubes and link motion is given in fig. 4, the arrangement of cab details in fig. 5, and a front view of the locomotive in fig 2. We shall give a description of the details of the engine in another issue, together with a drawing of the boiler, showing the method of staying and the style of lap adopted by the St. Paul road.

The following are extracts from new specifications which have just been completed by this road for all locomotives, which we give in considerable detail, as they have some advantages over the ordinary forms.

GENERAL CONSTRUCTION AND REQUIREMENTS.

All turned bolts, except bolts through pedestal caps, to be tapered ⅛ in. to the foot and holes for the same reamed.

*Castings* must be of smooth and close grained iron and free from sand holes or other defects. The pattern number must be formed on each piece in casting. All castings must be of full size called for.

*Forgings* must be of full size called for, must show thoroughly good welding and be free from indication of burning or flaws of any kind. In all cases where hammered iron is called for, the best quality in every respect must be furnished.

*All wrought iron* must conform strictly in quality and other respects to General Specification No. 11, and will be tested under the same.

*Boiler.*—Material, steel; workmanship to be throughout of the very best. All plates planed at edges and calked with round pointed calking tool. Sheets to be punched from opposite sides, so that when lapped the smallest diameters of the holes shall be at inside of joint. All flanged sheets carefully annealed after working; seams and plates to be carefully shaped and fitted before putting together, so that holes will be in line and that rivets may be thoroughly headed up without hammering plates in place. All flanging must be done at good red heat to avoid injury to plates.

*Boiler Test.*—Boiler designed to carry 160 lbs. working pressure, and to be tested with steam to 160 lbs. and hot water pressure to 230 lbs. per sq. in., and made thoroughly tight before lagging is put on.

*Stay Bolts.*—To be of iron, carefully threaded. Bolts to be screwed into sheets and headed over; stay bolts inaccessible to inspection outside must be drilled with teli-tale holes ¼ in. inside sheet.

*Flues* of iron, 2 in. outside diameter, No. 11 Birmingham wire gauge in thickness, set with No. 18 copper ferrules on back ends. Flues to be safe-ended and carefully swedged and beaded in fire-box end.

*Frames and equalizing beams* to be of charcoal hammered iron; welds to be V shaped.

*Piston rods* to be of hammered iron, accurately secured to piston and crosshead, according to gauges furnished.

*Guides* of case-hardened wrought iron and wearing surfaces trued.

*Crosshead* of cast steel; wearing surfaces of brass.

*Cylinders* must be made of a mixture of Salisbury charcoal iron 30 per cent.; Hanging Rock charcoal iron, 30 per cent.; good cylinder scrap, 40 per cent., and of such a hardness that the chill test will show a depth of white iron of not less than ¼ in. or more than ⅜ in. If the requisite amounts of proper scrap cannot be obtained, the amounts of pig-iron specified must be proportionately increased.

*Connecting rods* to be of hammered iron.

*Driving wheels* to be forced on axles at a pressure of not less than 70 tons, or more than 80 tons.

*Driving and truck axles* of hammered iron.

*Crank pins* of hammered iron, case hardened, to be accurately fitted and forced to place with not less than 30 tons pressure. Pins carefully trued after hardening. Crank pin fit in hub to be bored after tire is shrunk on.

*Cab* to be of well seasoned ash, with cherry sashes and plate glass. All glass in front and back of cab to be of two thicknesses.

TENDER.

*Tank* to be of 3,200 gallons capacity, made of iron and well put together.

*Wheels* must conform to the specifications adopted by the Master Car Builders' Association. They must be made in the "Barr Contracting Chill" and have the treads ground.

Wheels must contain at least 25 per cent. of Salisbury iron, from Lime Rock, Hunts Lyman, Canaan or Cornwall Bridge furnaces, unless express agreement in writing is had to the contrary.

If wheels are not made by party building engines, the contractor must arrange with wheel manufacturers to make at least [blank] wheels per day continuously, until order is filled, and give ample notice that the C., M. & St. P. Ry. Co.'s inspector may be present during the manufacture of the wheels.

Two wheels differing in size must not be placed on the same axle. They must be fitted with a pressure of not less than 30 and not more than 40 tons. They must be guaranteed to give a service of 50,000 miles, unless they fail from causes independent of the quality of the wheels.

*Samples* of wrought iron, paints, springs, boiler steel, flues and journal bearings, which are proposed to be furnished, must be sent to the Superintendent of Motive Power of this company for test and approval.

*Conditions of Contract.*—It is understood that these specifications call for a locomotive complete in every particular; that anything mentioned in specifications and not shown on drawings, or shown on drawings and not mentioned in specifications, shall be considered as specified. The work at all times shall be subject to inspection by the authorized agent of the company, and any work or material which is not first class or in accordance with specifications, will be rejected. The inspection of the work, however, will not relieve the contractor of his obligation to furnish material and workmanship as herein specified; and if upon trial engines prove defective, he will be required to make good the defect, or reimburse the company for the cost of doing same.

*Changes.*—The forms and dimensions given in the drawings and specifications must be strictly adhered to, and no variation therefrom will be permitted, except on the written consent of the Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul Railroad Co.

SPECIFICATIONS FOR LOCOMOTIVE JOURNAL BEARINGS.

Material will be an alloy, with composition as follows:

*Main Bearings.*—Copper, 84 per cent.; tin, 14 per cent.; antimony, 1 per cent.; lead, 1 per cent.

*Rod "Brasses."*—Copper, 84 per cent.; tin, 15 per cent.; lead, 1 per cent.

*Truck Bearings.*—Shell to have same composition as main bearings, the weight being carried on Babbitt strips.

To make this "Babbitt metal," melt one part of copper in a crucible and add one part of tin. Reduce the heat to a dull red, and add two parts more of tin and two parts of antimony. Stir until antimony is melted and have surface of metal covered with powdered charcoal. When the above alloy is melted, add three parts more of tin. Stir well and cast for use as required. This is called "hardening" and contains one part copper, two parts antimony and six parts tin.

For the final mixture, melt one part of "hardening" with two parts of tin; the resulting composition forms the standard "Babbitt" alloy, as follows:

Copper, 3.7 per cent.; antimony, 7.4 per cent.; tin, 88.9 per cent.

The metal used must in every case be new and of the following brands: "Lake Superior" copper, "Banca" or "Straits" tin and "Cookson" antimony.

All bearings will be subjected to analysis and must conform to the mixtures as specified.

These specifications have some novelties which are worthy of mention. For instance, it is required that all castings have the pattern number cast thereon. The boiler sheets are to be punched from opposite sides so that when lapped the smallest diameters of the rivet holes shall be together at the inside of the joint, and the fitting up is required to be done in such a way that the rivets may be thoroughly headed without hammering the plates into place. Both water and steam tests of the boiler are required. The piston rods are of hammered iron, while the cross heads have brass wearing surfaces on case-hardened wrought iron guides.

Attention is called to the cast iron mixtures given for the cylinders and wheels. The chill test given for cylinder iron is a convenient one to make, and one which should not be omitted, as a soft cylinder is a very expensive casting at any price. The boiler and details of this engine will be given later.

## Standard Rail Sections.

PROGRESS REPORT OF THE COMMITTEE ON STANDARD RAIL SECTIONS.

. . . It was resolved on motion of Mr. Morison that each member of the Committee be requested to propose a design, or scheme, for a set of sections, and transmit the same to the Secretary of the committee on or before Dec. 1, 1890; and that the Secretary be requested to canvass these suggestions and report to the Committee in what respects they agree and disagree. It was also resolved that these sections be prepared according to the individual preference of each member, regardless of any prior recommendations.

In accordance with this resolution ten different sets of designs have been prepared and transmitted to the Secretary, submitted by eleven different members, viz: Messrs. G. Bouscaren, J. Foster Crowell, S. M. Felton, Jr., H. Stanley Goodwin and Samuel Rea, J. D. Hawks, R. W. Hunt, George S. Morison, E. D. T. Myers, Thomas Rodd and A. M. Wellington. V. G. Bogue was appointed on the Committee too late to prepare a set of sections, and no set has been received from Mr. F. M. Wilder, the only remaining member of the Committee.

The last of these sets of sections was not received until just before the meeting; consequently the Committee has not yet been able to take any action upon the report of the Secretary in regard to them. The Secretary's report is subjoined to this report, with engravings of the several sets of sections, and the accompanying memoranda sent in by the members of the Committee.

These sections show a fair degree of agreement, considering that they were designed prior to all attempt at comparison of views. The further steps of the committee have not yet been determined on.

For the committee,
G. BOUSCAREN, Chairman.

*Report of the Secretary to the Committee.*

. . . Ten different complete sets of designs have been received, from eleven different members of the committee. Full-size drawings of these sections are shown on the accompanying sheet. Messrs. Rea and Goodwin submit a set of sections conjointly. The sections appear to show a remarkable degree of uniformity in their main features. In their several details they stand as follows:

1. The late Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails made the following recommendations: (1) 12-in. top radius; (2) ¼-in. corner radius; (3) vertical sides; (4) $\frac{1}{16}$-in. lower corner radius; (5) broad head relatively to depth. In regard to these details, the suggestions of the members of the present committee stand as follows:

(1) *12-in. Top Radius;* (2) *¼-in Corner Radius;* (3) *Vertical Sides.*—Nine sets of sections out of 10 agree with all these recommendations. The set by Messrs. Rea and Goodwin has $\frac{7}{16}$-in. to ½-in. corner radius, and slightly flaring sides, but retains the 12-in. top radius.

(4) *$\frac{1}{16}$-in. Lower Corner Radius.*—All sections have this except that Messrs. Hunt, Rea and Goodwin make it $\frac{1}{32}$-in., Bouscaren and Crowell $\frac{3}{32}$-in., Hawks a sharp corner (being 5 for $\frac{1}{16}$-in., 5 for a somewhat larger radius, and 1 for a sharp corner).

(5) *Broad Head relatively to Depth.*—This recommendation being indeterminate, the degree of agreement can best be judged from the sections. It appears to be unanimously accepted in principle, except that Mr. Morison sacrifices it to some extent to obtain the same width of head (2½ in.) for all sections from 50 to 100 lbs., inclusive. Messrs. Rea and Goodwin's sections are also a partial exception.

*Total Height.*—The preferences as to this may be tabulated as follows:

| Weight of Section. | Bouscaren. | Crowell. | Felton. | Goodwin and Rea. | Hawks. | Hunt. | Morison. | Myers. | Rodd. | Wellington. | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lbs. | | | | | | | | | | | |
| 40 | 3.50 | 3.75 | 3.50 | 3.50 | 3.62 | 3.50 | .... | 3.65 | .. | 3.67 | 3.58 |
| 50 | 3.87 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 3.95 | 4.00 | 4.00 | 4.00 | 3.98 |
| 60 | 4.25 | 4.25 | 4.00 | 4.25 | 4.50 | 4.25 | 4.33 | 4.40 | 4.25 | 4.33 | 4.28 |
| 70 | 4.62 | 4.62 | 4.50 | 4.50 | 4.75 | 4.75 | 4.68 | 4.73 | 4.75 | 4.67 | 4.66 |
| 80 | 5.00 | 5.00 | 5.00 | 4.75 | 5.00 | 5.00 | 5.00 | 5.07 | 5.00 | 5.00 | 4.98 |
| 90 | 5.37 | 5.37 | 5.50 | 5.00 | 5.19 | 5.50 | 5.30 | 5.38 | 5.25 | 5.33 | 5.37 |
| 100 | 5.75 | 6.00 | 6.00 | 5.25 | 5.50 | 5.75 | 5.59 | 5.68 | 5.50 | 5.67 | 5.47 |
| 110 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 6.00 | .... |

The sections sent in by Messrs. Morison, Myers and Wellington vary in height by some fixed law; all others determine heights arbitrarily. The effort seems to approximate to a uniform variation of ⅛ in. in height for each 10 lbs. per yard of difference in weight.

*Width of Base.*—The Goodwin and Rea set of sections has the base ½ in. wider than the total height throughout. Otherwise the width of base is the same as the total height throughout the sections, with but two partial sections: Crowell makes the 100-lb. section 5¼ in. base to 6 in. high; Mr. Wellington stops widening the base at 5 in. with the 80-lb. section (to and including which the width and height are alike) and retains a 5-in. base far a 90, 100 and 110-lb. section, with heights 5⅛, 5⅜ and 6 in. respectively. This is stated to be done for the reason that rails above 80 lbs. demand the use of base plates, for which a 5-in. base is sufficient, while for such heavy sections it becomes increasingly important to have sections well adapted for rolling.

MEAN DISTRIBUTION OF METAL. AVERAGE OF ALL SECTIONS.

| | Head per cent. | Neck per cent. | Base per cent. | Head varies between |
|---|---|---|---|---|
| Bouscaren | 44.5 | 20.4 | 35.1 | 42.7 and 45.3 per cent. |
| Crowell | 40.8 | 24.0 | 35.2 | 38.7 and 41.5 " |
| Felton | 42.6 | 18.7 | 38.7 | 39.5 and 44.3 " |
| Goodwin-Rea | 46.1 | 19.5 | 34.4 | 42.2 and 49.7 " |
| Hawks | 40.6 | 22.5 | 36.9 | 36.6 and 42.9 " |
| Hunt | 41.0 | 20.9 | 38.1 | 40.0 and 42.0 " |
| Morison | 41.5 | 21.0 | 37.5 | Ratio uniform. |
| Myers | 43.2 | 20.7 | 36.1 | 40.6 and 44.0 " |
| Rodd | 44.6 | 19.0 | 36.4 | 44.0 and 46.2 " |
| Wellington | 40.0 | 22.5 | 37.5 | Ratio uniform. |
| Average | 42.79 | 20.92 | 36.59 | |

The apparent intent in all the sections, the set of Messrs. Rea and Goodwin excepted, was to distribute the metal to head, neck and base in a constant percentage for all sections. . . . Messrs. Bouscaren, Felton and Hawks show a tendency to slightly decrease the percentage in the head as the weight increases; Messrs. Goodwin and Rea, to increase the percentage in the head as the weight increases. All other sections (including practically 9 of the 10 sets) tend to a constant percentage regardless of weight, as shown in the following table [Table omitted; see sheet of sections.—EDITOR] showing the percentage of metal in the head of each section. . . .

*Width of Head.*—The preferences as to this may be tabulated as follows:

| Wt. of section, lbs. per yard. | Bouscaren. | Crowell. | Felton. | Goodwin and Rea. | Hawks. | Hunt. | Morison. | Myers. | Rodd. | Wellington | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 1.87 | 2.00 | 2.12 | 1.78 | 1.87 | 1.87 | .... | 1.82 | .... | 2.12 | 1.94 |
| 50 | 2.06 | 2.12 | 2.25 | 2.12 | 2.06 | 2.06 | 2.50 | 2.00 | 2.19 | 2.25 | 2.16 |
| 60 | 2.25 | 2.25 | 2.37 | 2.28 | 2.19 | 2.19 | " | 2.20 | 2.31 | 2.37 | 2.29 |
| 70 | 2.37 | 2.34 | 2.50 | 2.47 | 2.31 | 2.56 | " | 2.37 | 2.37 | 2.50 | 2.43 |
| 80 | 2.50 | 2.50 | 2.62 | 2.55 | 2.50 | 2.62 | " | 2.53 | 2.50 | 2.62 | 2.54 |
| 90 | 2.62 | 2.72 | 2.75 | 2.75 | 2.75 | " | " | 2.69 | 2.56 | 2.75 | 2.67 |
| 100 | 2.75 | 2.87 | 2.87 | 2.86 | " | " | " | 2.84 | 2.81 | 2.87 | 2.73 |
| 110 | .... | .... | .... | .... | .... | .... | .... | .... | .... | (3.00) | .... |
| Total range, 40 to 100 lbs. | 0.87 | 0.87 | 0.75 | 1.08 | 0.87 | 0.75 | none | 1.02 | 0.62 | 0.75 | 0.79 |

Messrs. Felton and Wellington submit uniformly varying widths of heads (varying by ⅛ in.); all others vary irregularly or (Morison's) not at all.

*Depth of Head.*—This may be tabulated as follows:

| Wt. of section, lbs. per yard. | Bouscaren. | Crowell. | Felton. | Goodwin and Rea. | Hawks. | Hunt. | Morison. | Myers. | Rodd. | Wellington. | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 1.06 | 1.12* | 1.00 | Not tabulated. See sections. | 1.00 | 0.98 | ..... | 1.12† | ..... | 0.90* | 1.02 |
| 50 | ..... | 1.19 | 1.12 | | 1.12 | 1.12 | 1.01* | 1.23† | 1.19 | 1.01 | 1.12 |
| 60 | 1.33 | 1.25 | 1.25 | | 1.25 | 1.28 | 1.17 | 1.35 | 1.37† | 1.17* | 1.27 |
| 70 | ..... | 1.44 | 1.37 | | 1.37 | 1.39 | 1.34 | 1.45 | 1.47† | 1.28* | 1.39 |
| 80 | 1.58 | 1.50 | 1.50 | | 1.50 | 1.50 | 1.50 | 1.56 | 1.62† | 1.39* | 1.51 |
| 90 | ..... | 1.56 | 1.56 | | 1.50 | 1.56 | 1.66 | 1.65 | 1.81† | 1.49* | 1.60 |
| 100 | 1.70 | 1.62 | 1.62 | | 1.50* | 1.70 | 1.82† | 1.74 | 1.78 | 1.58 | 1.70 |

* Minimum. † Maximum.

*Angle of Base of Head and Top of Base.*—All sections have these two angles alike. Messrs. Crowell, Felton and Rodd use 13 degrees; Messrs. Rea and Goodwin, 13½ degrees; Messrs. Hunt, Morison and Wellington, 1 in 4, or 14 degrees; Mr. Myers, 1 in 4½, or 12 degrees; Mr. Bouscaren, 12 degrees, and Mr. Hawks, 11 degrees.

*Fillet Radius.*—In every case but one this is the same at both top and bottom of the neck. Messrs. Bouscaren, Felton, Goodwin, Hawks, Hunt, Rea, Rodd and Wellington use ¼ in.; Mr. Meyers, ⅜ in.; Mr. Morison, a variable radius varying inversely with the weight of sections from 0.37 to 0.19 in., averaging about 0.27 in.; Mr. Crowell uses $\frac{1}{16}$ in. for the upper radius, and ⅛ in. to ¼ in. for the lower radius, the small upper radius being stated to be used for the purpose of improving the bearing of the fish-plate.

*Radius of Sides of Neck.*—Messrs. Morison, Myers and Wellington use straight sides, and Felton 30-in. radius; Messrs. Bouscaren, Crowell, Hawks, Hunt and Rodd use 12-in. radius, and Messrs. Goodwin and Rea, 9-in. radius.

This cannot usefully be tabulated, as the sides are not of the same form, and can best be judged of from the sections and the percentages of metal in the neck, as shown above. . . . As all the sections have been in the custody of the Secretary, he desires to state that his own sections were designed quite independently of the rest and before he had received most of them.

Mr. J. D. Hawks, of the committee, submits in the accompanying engraving an experiment made to test the effect of flat and thin heads. Two of the Michigan Central 80-lbs. rails had ⅛ in. planed off their tops, as shown, and were placed on sharp curves. The rail marked "No. 1" was used on the outside of an 8-degree 18-ft. curve for 275 days, during which time 63,800 engines and 447,425 cars passed over it, an average of 232 engines and 1,627 cars per day. The rail marked "No. 2" was used on the inside of a 13-degree 45-ft. curve for 655 days, during which time 200,430 engines and 414,615 cars passed over it, an average of 306 engines and 633 cars per day. The result upon the shape of the top was as shown. [Engraving not received.—EDITOR.]

. . . At an informal meeting of the committee held after the annual meeting, it was recommended that the Secretary prepare a set of sections averaging as nearly as might be the individual sections, neglecting any wide deviations which appear in one set of sections only. The Secretary's engagements have not permitted him to do this, but a set having the following dimensions would come very near to such an average section.

Head, 12 in.; top radius, ¼ in.; corner radius, $\frac{1}{16}$ in.; lower corner radius, vertical sides; percentage of metal, 41.5 per cent. (neglecting both the Goodwin Rea and Rodd sections as erratic); width varying by ⅛ in. for each 10 lbs., as follows:

| Weight of section in lbs... | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|
| Width of head in inches.. | 2.0 | 2⅛ | 2¼ | 2⅜ | 2½ | 2⅝ | 2¾ |

Neck, 21 per cent. of the metal; ¼ in. top and bottom fillet radii; either straight sides or 12 in. side radius (there appears to be a division of sentiment on this point); thickness as determined by percentage and following dimensions:

Base, 37.5 per cent. of the metal; 13 deg. top angle (as

Fig. 4—Section through Link Motion. Fig. 5—Back End Elevation.

16 IN. × 24 IN. EXPRESS LOCOMOTIVE. CLASS B"—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

also for under side of head); width same as total height of rail; vertical sides with $\frac{1}{10}$-in. top and bottom corner radii.

Total height and width of base varying by $\frac{1}{8}$ in. for each 10 lbs. of section, and as follows:

| Weight of section in pounds | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|
| Total height and width, inches | 3.67 | 4.00 | 4.33 | 4.67 | 5 00 | 5.33 | 5.67 |
| Actual average for width, inches | 3.88 | 3.98 | 4.28 | 4.66 | 4.98 | 5.32 | 5.67 |

Respectfully submitted,
A. M. WELLINGTON,
*Secretary of Committee.*

The following are the communications sent in by the members of the committee in explanation of their respective designs:

Mr. G. Bouscaren writes: I send a tracing showing full-size sections for 40, 60, 80 and 100-lb. steel rails, and a tabulated statement giving the dimensions and all other elements of these sections.

The rulings taken for guidance in their preparation are:

*First*—Weight of metal, 1 square inch area, 1 yard long = 10.20 lbs. To facilitate comparison we should have agreed on a modulus for the weight of steel at our last meeting. I suppose there will be some variations as to the modulus assumed by the different members of the committee. . . .

*Fourth*—Angle with horizontal, of bottom surface of head and top surface of flange equal to 12 degrees for all sections. I think this angle should be as small as consistent with the resistance to bending and shearing in the projection of head and flange, in order that the thickness of flange at the edges be as large as possible. This is the weak point of the rail; all fractures generally start there. . . .

Mr. J. Foster Crowell incloses tracings of full-size sections of rails from 40 to 100 lbs. per yard, four in all, and a tabular statement of dimensions, etc., of sections of 40, 50, 60, 70, 80, 90 and 100 lb. He says there is a slight inconsistency in the matter of the radii of base fillets, which are given as $\frac{1}{8}$-in. for the 40 and 100 lb., and $\frac{1}{4}$-in. for the intermediates. This is because he has considered them with reference to the strength of the rail as a beam only. . . .

Mr. J. D. Hawks writes: There are some features of my suggested sections herewith sent that I would strenuously insist on retaining. There are other features that I would readily consent to modify. It will be noticed that the width of head in the 90 and 100 lb. sections is the same. I think it is as wide a head as could be used with safety in a Northern climate, and think so from the experience of the Michigan Central many years ago with a wide-topped rail, and the difficulty they had by reason of the wheels leaving the track in snowy weather. I have retained the thin head that we use on the Michigan Central on our 80 lb. rail for the 90 and 100 lb. sections. There would be no great objection to making the head somewhat thicker for the latter sections if it was considered advisable.

Mr. George S. Morison reports a set of standards, and says: These standards are for rails varying by 5 lbs. from 50 lbs. per yard to 100 lbs. They are designed in accordance with regular principles which may be applied to any weight of rail, some of which principles relate to the general design of the rail, and some to the three distinctive parts. The dimensions are based on a weight of 490 lbs. per cubic foot of steel.

*General Design.*—The rail is adapted to the form of joint in most general use, which is the angle-plate joint, and also to lay on ties in accordance with the general American practice.

The distribution of metal between the three parts of the rail is fixed as follows:

| | |
|---|---|
| Head | 41.5 per cent. |
| Web | 21. " |
| Base | 37.5 " |

These percentages are kept constant for all weights of rail.

. . . The width between the parallel vertical sides of the head has been made $2\frac{1}{2}$ in., and is kept uniform for all weights of rail. This is a radical departure from the usual practice of rail designs, but is regarded as a very important thing. The different weights of rail are determined by the amount of business which they are expected to carry, seldom by the character of the traffic which passes over them. The same wheels run on light and on heavy rail sections. If the weight is to be carried properly down the centre line of each rail, the distance between that centre line and the gauge line must be kept constant. Furthermore, if the wear on wheels and rails is to approach uniformity, the wearing surface of the rails must be of uniform shape. The amount of metal in the head is $41\frac{1}{2}$ per cent. of the total metal in the rail, which makes the variation in the cross section of the head for each 5 lbs. weight of rail 0.204 sq. in. As the only variable in the head is the height, this variation of weight corresponds to variation of height, 0.081 in. for each 5 lbs. weight of rail. The heights of head are calculated on this basis.

*Base.*—. . . The 80-lb. rail is taken as a basis to start from, the width of base for this rail being taken as 5 in. This width corresponds to a height of base of 0.90 in. The dimensions of the base will always be determined by the width and height, and these dimensions will vary as the square root of the weight of rail.

*Web.*—The sides of the web are made parallel. This arrangement is adopted to prevent using too thin metal for the centre of the web in the lighter rails, and to prevent using too small a radius for the fillet connecting the web with the head in the heavier rails. The width of the web measured from out to out of the fillet is kept constant, and this width is fixed at 1 in. This leaves a width of $\frac{3}{4}$ of an inch on each side under the head for the bearing of the angle plates, which is little enough. The height of the web will always be determined by deducting from the total height of the rail (which is the same as the width of the base) the sum of the heights of the head and base. Heights of web are calculated in this way. To ascertain the thickness of the web, the area of the web must first be calculated; from this area a small correction must be deducted to correspond to the four fillets and the triangles above and below the central height, and the remainder must be divided by the height. The correction to be made is smaller than would at first be expected, and has been taken as 0.054 sq. in., which is slightly too much for the lighter rails and slightly too little for the heavier, but the error is not enough to be material. On this basis the thickness of the web has been calculated. The radius of the fillet at top and bottom is also a variable. If the angle here was a right angle, it would be equal to one-half the difference between 1 in. and the thickness of the web. As, however, there is an inclination of one in four, the radius is 1.32 times this difference. The radii of the fillet have been calculated on this basis.

*General.*—The method of determining all the variable elements in the several sections of rails having been explained, it remains only to tabulate the results. For convenience the elements have been designated by letters as follows:

| | | | |
|---|---|---|---|
| Height of head | *a* | Height of web | *d* |
| Width of base | *b* | Thickness of web | *e* |
| Height " | *c* | Radius of fillet | *f* |

The table is as follows:

| WEIGTH OF RAIL. | HEAD. | BASE. | | WEB. | | |
|---|---|---|---|---|---|---|
| | *a* | *b* | *c* | *d* | *e* | *f* |
| 50 | 1.01 | 3.95 | 0.71 | 2.23 | 0.44 | 0.37 |
| 55 | 1.09 | 4.15 | 0.75 | 2.31 | 0.47 | 0.35 |
| 60 | 1.17 | 4.33 | 0.78 | 2.38 | 0.50 | 0.33 |
| 65 | 1.26 | 4.51 | 0.81 | 2.44 | 0.53 | 0.31 |
| 70 | 1.34 | 4.68 | 0 84 | 2 50 | 0.56 | 0.29 |
| 75 | 1.42 | 4.84 | 0.87 | 2.55 | 0.58 | 0.28 |
| 80 | 1.50 | 5.00 | 0.90 | 2.60 | 0.61 | 0.56 |
| 85 | 1.58 | 5.15 | 0.93 | 2.64 | 0.64 | 0.24 |
| 90 | 1.66 | 5 30 | 0.95 | 2.69 | 0.67 | 0.22 |
| 95 | 1.74 | 5.45 | 0.98 | 2.73 | 0.70 | 0.20 |
| 100 | 1.82 | 5.59 | 1.01 | 2.76 | 0.73 | 0.19 |

From this table the sections given on the accompanying sheet have been drawn.

On the first section (which is that of an 80-lb. rail) all the constants are marked, these being the width of head, the width outside the fillets, and the radii of all convex curves. On the other eleven sections, which are marked with their respective weights, the veritable dimensions are marked.

Mr. E. T. D. Myers writes: My endeavor has been to base my suggestions upon the recorded recommendations of a committee of the Society, and also upon the deductions of those who have been close observers, whether as makers or users of rails. Whilst these sections do not contemplate the use of base plates, I am nevertheless one of those who believe that better methods of increasing both the bearing of the rails, and their hold upon the ties, will, in the near future, come into use, and with them substantial modifications in the form of rails.

Mr. Thos. Rodd writes: I send a little diagram showing approximately how the 80-lb. rail would wear down on a curve. The unit strains in compression, considering the rail as a beam, non-continuous, at 20-in. bearings, are given for the original section and for the reduced section, allowing in each case 40,000 lbs. as the extreme fibre strain. The little table subjoined gives the centre breaking load of the original section and of the worn section, the depth of wear being the same in each case, and as shown in each section, and the allowance being also made for side wear, as shown on the section for curves, the extreme fibre strain being taken as 40,000 lbs. . . .

| ORIGINAL SECTION. | | WORN SECTION. | | |
|---|---|---|---|---|
| Weight. | Centre breaking load. | Per cent. of head worn. | Centre breaking load. | Per cent. of original strength remaining. |
| Pounds. | Pounds. | | Pounds. | |
| 50 | 43,200 | 35.0 | 29,800 | 69.0 |
| 60 | 52,700 | 33.8 | 38,100 | 72.3 |
| 70 | 68,300 | 31.8 | 51,200 | 75.0 |
| 80 | 80,800 | 30 1 | 60,600 | 75.0 |
| 90 | 93,600 | 32.9 | 78,900 | 84.3 |
| 100 | 111,400 | 28.0 | 98,000 | 88 0 |

Mr. A. M. Wellington writes: The following dimensions are assumed by me as constants throughout the sections:

*12-in. Top Radius, ¼-in. Corner Radius, Vertical Sides, ½-in. Lower Corner Radius.*—Pursuant to recommendations of former Committee on Form of Rails and Wheels, and for the reasons stated in their report.

1 to 4 (14 degrees) angle of lower side of head with the horizontal, adopted instead of 13 degrees, which is perhaps more usual, for the reason that it does not sensibly diminish the efficiency of the fish-plate bearing, while fish plates are used, and gives a slightly better form of section if fish plates are not used. . . .

*Neck*—Vertical Sides.—In order that the thin metal furthest removed from the top and bottom masses may not cool too rapidly; the neck is made fairly thick for the same reason, and to avoid concentrating too much of the work done in rolling on the neck. If it be true, however, that the extra work done on these masses suffices to keep them hot enough, my impression is that these sections might be improved by removing some metal from the neck and adding it to the extremities of the base. . . .

*Width of Head.*—I believe this should be as wide as possible for all sections, and therefore that it should increase about in proportion with the height. It is desirable, on the other hand, to give some weight to the desirability of having all rail-heads of the same width. With perfectly flat rail-tops this would be quite important; with a 12-in. top radius, I believe it to be of very minor importance, for the reason that a worn tread naturally wears to about a 12-in. radius for a width considerably wider than the widest rail-head, and therefore fits well any rail-head not over 3 in. wide, on the principal of the ball-and-socket joint. . . .

## Recent English Patents on the Compound Locomotive.

*F. J. Burrell*, Thetford, Norfolk. Compound Locomotive Engines. March 19, 1890.—Steam is expanded in succession in four double-acting cylinders, viz., a high-pressure cylinder 1, a first intermediate pressure cylinder 2, a second intermediate cylinder 3, and low-pressure cylinder 4. The cylinders 1 and 4 are arranged between the frames below the smokebox, and their pistons are fixed respectively on piston rods. The cylinders 2 and 3 are arranged axially in front of the cylinders 1 and 4 respectively, and their pistons are fixed on extensions of the piston rods. The cranks are arranged at right angles to each other, and inside the framing. The slide valves 9 and 10 are actuated by a common valve rod 11, and the slide valves 7 and 8 are also actuated by a common valve rod, each valve rod being operated by a separate set of Joy's valve gear. Steam is supplied by the steam pipe 12 to the valve chest of the cylinder 1, when after acting in one direction upon the piston it exhausts by a connecting pipe 13 into the valve chest of cylinder 2, where it is so distributed as to act upon the piston 2a in the other direction. The exhaust steam passes from the cylinder 2 through an exhaust passage 14 into the valve chest 3b, whence it is distributed by the valve 9 to act upon the

Fig. 1.

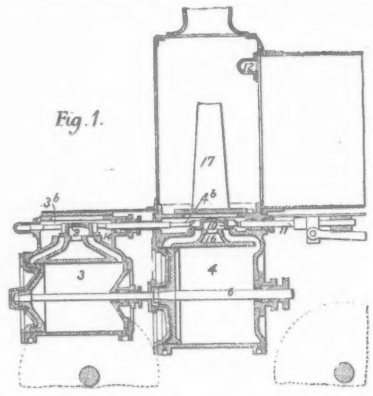
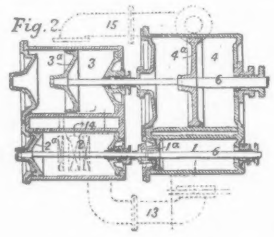


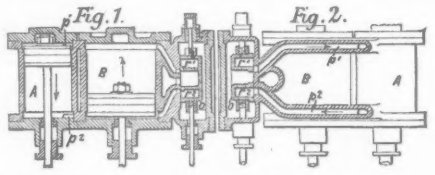
Fig. 2.



piston 3a, after which it exhausts through a connecting pipe 15 into the valve chest 4b. The exhaust steam from the cylinder 3, admitted by the valve 10 into the cylinder 4, acts upon the piston 4a, and finally the steam escapes from the cylinder 4 through an exhaust passage 16 and the usual exhaust pipe 17. (Accepted Dec. 24, 1890.)

*J. Klein*, Frankenthal, Germany. Compound Steam Engines. Oct. 31, 1890.—This invention relates to an improved expansion distributing slide valve motion, with steam chests filled with steam from the boiler for compound engines, which is characterized by the arrangement of a distributing slide valve *O*, common to two cylinders *A* and *B*, arranged in the slide-box of the large cylinder *B*, whereby the inlet and the outlet passages $p^1$ and $p^2$ of the small cylinder *A* become very long, and form thus with the chambers $r^1$ and $r^2$ steam

Fig. 1. Fig. 2.



chests, while the low-pressure cylinder has short passages, so that always one chest at the forward stroke of the piston in the low-pressure cylinder is filled with steam from the boiler, and then shut off in order to make at the subsequent backward stroke of the piston its steam filling, and that of the corresponding side of the high-pressure cylinder to expand directly by the agency of the slide *O* into the opened low-pressure cylinder, and to perform work. (Accepted Dec. 24, 1890.)—*Engineering.*

## Maine Railroad Commissioners' Report.

Messrs. D. N. Mortland, A. W. Wildes and Roscoe L. Bowers, Railroad Commissioners of Maine, have issued the thirty-second annual report of the board, which is for the year ending Dec. 31 last. The statistics are for the year ending Sept. 30. It will be remembered that the Maine railroad commission was practically of little account until last year, owing to the lack of financial appropriations. This board is also peculiar in that its prime object, as stated in the acts creating it, is "to secure the safety and convenience of travelers." The opening chapter of the report discusses at considerable length the causes of injuries to passengers and employés and the possible remedies. The commissioners regard it as "surprising that young men are willing to engage in such hazardous employment" as braking and other train work. The State Bureau of Industrial Statistics reports the average of monthly wages received in that state as $39.96 for brakemen, $60.17 for freight conductors and $69.46 for enginemen; and it is concluded that high pay is not the attraction.

The commissioners speak of defects of various M. C. B. type of couplers heretofore used, and say that "no attempt has yet been made by any road in New England to give vertical plane couplers a trial;" but they conclude after all that sufficient improvements have been made to warrant the immediate adoption of the type.

Steam direct from the locomotive for car heating "has been generally substituted, though other methods are still in use on many roads in the state." The law in Maine against fires in cars is rigid, but the commissioners have not deemed it wise to enforce it any faster than the action of the authorities of Massachusetts and New Hampshire will justify such enforcement on through trains. They have, therefore, temporarily approved of the use of individual heaters. The law now requires all "common stoves" to be removed from cars, *whether such stoves are in use or not.* Auxiliary heaters for emergencies

are, however, needed, and a change in the law is recommended.

Forty two miles of road was built during the year. The report is accompanied by a new map of the state, prepared for the board by Chief Engineer W. H. Allen, of the Maine Central. One passenger and nine employés were killed and four passengers and 30 employés were injured during the year. Two of these passengers were injured in a derailment, but all the other casualties seem to have been unconnected with train accidents. The usual reports of the roads are appended, but there are hardly any summaries of the statistics which they afford.

### Massachusetts Railroad Commissioners' Report.

Messrs. George G. Crocker, Edward W. Kinsley and Everett A. Stevens, Railroad Commissioners of Massachusetts, have issued the twenty-second annual report of the board. This board, unlike that of Maine, was not established chiefly for the protection of life and limb, but the commissioners nevertheless give their opening chapter, and one of the most emphatic in the report, to the subject of walking on tracks, and they describe in forcible terms the distressing circumstances attending the killing of 119 and the injury of 80 trespassers on the railroads of Massachusetts during the past year. Of the total (199), 158 were walking on the tracks and 41 were stealing rides on freight trains. The number of passengers killed in the state was only one-third as large as the number of trespassers, and the number of employés killed was only a little over one-half as large. On the average the number of trespassers killed is about equal to the whole number of other persons, of all classes, killed in the operation of railroads. Sixty per cent. of the whole number of accidents to trespassers are fatal accidents. If a person walking on the track is struck by a train, the probability is that he will be killed. Most of those who are not killed are crippled for life. The condition of affairs in other states is much the same as in Massachusetts.

As compared with its importance, the prevention of this loss of life is not impossible or even difficult. Reference is here made to the better conditions prevailing in England and Germany. The law in Massachusetts forbids walking on tracks, but it is a dead letter. The pecuniary loss resulting to the railroads from the killing and maiming of trespassers is not material. On the other hand, "the companies have found that their efforts to secure a conviction of a trespasser under the law are attended with considerable labor and expense, are generally failures, and not infrequently are followed by retaliatory measures, such as the destruction of their property by fire or otherwise and the placing of obstacles on their tracks. They can hardly be blamed for coming to the conclusion that their duty to the public, as well as to themselves, demands that they should not undertake the very dangerous task of enforcing the law, when the chief object of such enforcement is simply to save people from losing their lives and limbs in doing that which they have no right to do." The commissioners have counted the trespassers on certain roads on several occasions, and find that on the eight lines of railroad running into Boston, and within a radius of twenty miles, there are on pleasant days probably 40,000 people using the tracks as a footway, without right. This use is not confined to the vicinity of Boston, and in many places is more general than there. For various reasons the public conscience has not been aroused. It is, therefore, the peculiar province of this board to keep up agitation on the subject. The commissioners therefore earnestly hope that the statute prohibiting trespassing may be amended so as to be more efficient. Where the public convenience requires a footway alongside the line of a railroad, such footway should be provided; but it should be made safe, and the towns should exercise their authority to lay out such paths.

*Car Heating.*—A table is given showing the progress in heating passenger cars by continuous steam systems during the past four years. The total number of cars now heated by steam from the locomotive is 1,347. Considering the comparative leniency of the law, the progress made during the year is regarded as on the whole commendable. The commissioners regard continuous systems as now so well developed that there will be no excuse for a road on which any person is killed by fire from individual heaters.

*Blocking Frogs and Switches.*—The law on this point is defective, but the board has persistently used persuasion and entreaty, "agencies congenial to it and in harmony with the principles on which it was founded," and considerable progress has been made. All the roads promise to properly equip their lines.

*Grade Crossings.*—Fifteen new highway grade crossings have been established (all on the Grafton & Upton, authorized by the Legislature after the board declined to take action) and 21 have been abolished; corrections in count on two roads have been made and the net increase for the year is 16 crossings. The Wrentham Branch of the Old Colony, 12 miles, has been built during the year without a single grade crossing. Under the new law, by which the state pays about one-fourth of the expense of abolishing grade crossings, applications have been made by cities and towns for the change of 30 crossings and by the railroads for the change of 37; of this last number 26 are on the Boston & Albany. Nothing is said about decisions under this law.

*National Legislation.*—Extended reference is made to the conference of railroad commissioners at Washington, and the importance of harmony in the regulation of railroads by the several states and by the general government is urged. The railroad laws of Massachusetts need revision and consolidation, and it is proposed that the work be undertaken systematically and with careful reference to the principles just mentioned. It is suggested that a railroad act, systematic in its arrangement and prepared by men of experience and learning, might be followed as a model in other states, and might prove a valuable agency for promoting greater harmony in the laws of the several states.

*Couplers.*—During the year six employés have been killed and 152 injured in coupling or uncoupling cars. Reference is made to the objections to the Master Car Builders' type of coupler prevailing among New England railroad men, and other difficulties are discussed, the conclusion being that Congress should authorize the Interstate Commerce Commission, or some other commission, to prescribe certain conditions which freight car couplers must fulfill. To define the contour lines of a coupler neither takes away from the railroads the responsibility for poor material nor for poor design. The claim that the principal roads are equipping their freight cars with couplers and power brakes as fast as possible is not fully admitted. The progress thus far made is remarkable, but, if unaided, will not be complete for many years. Under the law of 1884 the board has approved certain couplers of various types. It is now contemplated to revoke some of these approvals.

*The Bell Rope.*—On this subject the report says: On most of our trains the bell rope is a delusion. To pull the rope so as to ring the bell on the engine requires skill as well as strength even on short trains, and on the last cars of long trains is practically impossible. While the air-brake handle in cars is a valuable instrumentality for stopping a train in an emergency, it is clear that some better or additional means of communicating with the engineer ought to be supplied. If no one of the many devices intended to meet this need is worthy to supplant the bell rope, some of them are at least valuable as supplementary to it.

*Miscellaneous.*—The board has given careful attention to the matter of electric street cars and has made elaborate tests of their brake power. The accidents by electric and horse cars are tabulated and compared. There were on Sept. 30 last 158 miles of electric road operated by overhead systems, and 3 miles operated by storage batteries. The need of better brake power on passenger cars, as shown by the Quincy and other accidents, is carefully set forth. Additional legislation concerning private grade crossings and other subjects is recommended. The New York & New England has persistently neglected to provide a suitable station at a certain place, as recommended by the board.

Six pages are given to a general summary of accidents. The number of casualties reported to the board from time to time as they occurred (during the year ending June 30) was 730, but the annual returns of the roads show only 711, a discrepancy which is not explained. The only passengers classified as killed by causes beyond their own control are the 21 killed at Quincy. The reports from the different roads still show that some of the companies are more careless than others in reporting the number of persons killed and injured from the various causes.

*Statistics.*—The length of new road constructed during the year ending June 30 was 22 miles, and the length of road in the state is now 2,089 miles. The average cost of standard gauge roads, with equipment, is $76,762 per mile. The capital stock of the roads reporting was 157 millions, an increase of 5½ millions, about two-thirds of which was on the New York, New Haven and Hartford.

Gross earnings were 59¼ millions, an increase of 3½ millions; operating expenses 39¾ millions, an increase of 2 millions. Interest, taxes and rentals amounted to 15½ millions, leaving 10¾ millions applicable to dividends, an increase of $1,688,308. Passenger miles were 1,458 millions, an increase of 102 millions. Ton miles were 1,977 millions, an increase of 205 millions. Gross earnings per mile were $14,984, and the percentage of expenses was 67, higher than any year since 1883. The amount of dividends declared was $8,450,560, an increase of a million. The average earnings per revenue train mile were $1.617. The average cost per train mile was 87.2 cents, not including taxes. The average fare per passenger per mile was 1.83 cents.

The appendix contains, besides the usual statistical information, full reprints of the special reports on accidents made during the year, including that on the Quincy disaster, accompanied by drawings and photographs.

### The Hanging of Brake Beams.

At the January meeting of the Southern and Southwestern Railway Club, one of the topics taken up was "Brake Beams Suspended from the Car Body vs. those Hung from the Trucks."

Mr. Leeds, of the Louisville & Nashville, who was to open the subject, was unable to be present, but he sent the following:

In considering this subject let us first take the matter of safety. In thirty years of observation I have never known a hand crushed directly between the drawheads of cars in coupling; still, from late reports one would think this the greatest danger of coupling, while the facts are, it is *one* of the least; cases of fingers and hands caught between pin and dead-wood, hands and arms between dead blocks, etc., or feet caught by the wheel are more numerous; and I have seen several accidents from the brake beam catching and holding the foot and ankle in the best of positions for the wheel to do its work by throwing the person down. Now, some trucks must be built where an inside hung brake is impracticable, and so the only thing we can do in such cases is to make the outside one as safe as possible. My idea is to either so hang it as to enable brakemen and switchmen to step on it and ride when coupling, or to carry the beams so far under the car as to be always out of the way. This last cannot well be done, but the former can be accomplished by using hangers so short as to preclude all danger of them swinging sideways, and by placing hand rails on the end of cars at each of the four corners.

As to safety in running, any of us would hesitate to say that a truck built so rigid that all the wheels were held in the same plane, regardless of whether one of them was supported or not, was as safe as the passenger truck with each wheel free to follow every depression by the vertical play of the box in the pedestal. Then why is it safe to clamp these wheels to a rigid body in such a manner as to make it impossible not only for one wheel, but any of them, to accommodate themselves to the conditions of the track, even on a straight line? This is, in my opinion, poor practice, as the strain thrown on hangers is about the same when the wheel strikes a low joint as though it was a suspension bolt suddenly made to carry the entire load on that wheel, our system of hanging below the centre of the wheel making the connection rigid. But the great danger, as my observation apparently teaches, is in going on to a curve or coming off one, either on to a straight line or on to a reverse curve, with the truck clamped rigidly to the body by the brakes being set. On a straight line the normal conditions are that each wheel is held equidistant from the body, but striking a sharp curve with great elevation, both the canting of the truck and the position which the body takes (according to speed) brings the truck and body closer together on the outer side than the inner if the brakes are not set, and tries to do so if they are; under these conditions the brakes must slip on the wheels (which they can scarcely do), or else, failing to break the hangers, must carry the weight of inner side of the truck while going around the curve in just so far as the car has a tendency to right itself or assume a perpendicular.

From several years close study of the causes of derailment, reported as caused by brake beams falling down, etc., both by taking notes at the scene myself and by having others, fully qualified, to do so, look out for the same indications. I have nearly always found the derailment at or near a curve, or found a bad low joint just where the first marks were found. In nine cases out of ten it has been body hung brakes and the hangers in every case (where I was satisfied the brake was the cause) showed a new fracture or the fastening recently torn out.

As a straight out denial has been made as to conditions named ever existing, I would ask any gentleman if he ever undertook to let a break-off that had been applied under one of these conditions after they were changed. I have tried it often and found that a brake that I had applied on a curve I could not release when on a straight line, and the reverse I have also found true. I have sometimes to build trucks where the inside hung brake cannot be applied, and I hand you blue print showing how such brakes are now being hung; it will be noticed that the additional framework is utilized to derive the benefits of a lipped arch bar.

President E. S. Marshall also sent a communication as follows:

My observation compels me to conclude that the method of hanging brakes exerts a potent influence in the safe running of the trucks. We have a rigid truck as our standard for passenger engine tanks, and for a long time we suffered much annoyance and damage from frequent derailments of the rear truck, the track always being reported in good condition, with no apparent cause for trucks leaving the rail. When personally looking into the matter I had occasion to ride on one of the engines in question when the rear trucks of tank jumped the track. I noticed a very slight depression in the track, and as engineer applied the air brake (we were running about 33 miles per hour) I saw back truck rise from rail. On investigation I found the hangers hung from the frame of the tender, and the brake shoe and beam hung down under the centre of wheel, on what we might designate as the bottom quarter. I had the hangers shortened up so that the shoe would strike the wheel at the centre, and since then we have had no further trouble.

To better satisfy my mind on the subject, I had a similar hanger hung to the body of a baggage car with a swing motion truck under it, which formerly had the brakes hung from the truck frame. I hung the brakes from car body as an experiment and found that they produced the same results, viz., the derailment of the rear truck. My conclusions, derived from the results of the tests, are that the brakes should be hung from the truck frame, or else the hangers should not be long enough to bring the shoe below centre of the wheel. I fully agree with Mr. Leeds that the subject is of great importance, and that not enough consideraton is given to the imperfect character of brakes hung to the car body. I believe that many wrecks, had they been closely investigated, could only have been attributed to this cause.

The discussion of this subject was to be continued at the meeting of Feb. 19.

### Oil as Fuel.

The *Cleveland Iron Trade Review*, in an article calling attention to the increasing use of oil for fuel, says that the manufacturers of Cleveland are taking 6,000 barrels of crude oil a day. The consumption of crude oil for fuel has lately developed amazingly; as short a time ago as 1887 the total consumption was only 5,500 barrels, and in 1890 it had increased to 11,000,000 barrels. This development is greatly due to the construction of pipe lines from the Lima field, a proceeding necessitated by the difficulty of properly refining Lima oil. The Standard Oil Company furnishes about four-fifths of the fuel oil, and independent concerns the balance. Lately the oil refiners have received a marked accession to their resources through the increased demand for the products from "residuals," or the substances left in the stills after the distillation of illuminating oils. These at first were unsalable and considerable expense was incurred in disposing of them; but lately the demand for heavy oils, wax and paraffine has been so great that, according to the *Paint and Oil Reporter*, the returns from the residuals has been greater than from illuminating oils.

RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Mr. J. N. Barr writes, concerning the question raised by us as to whether or not he considered the inertia of the reciprocating parts in his investigation of the irregular wear of locomotive tires, that he feels this to be a very severe criticism on the merits of the paper. We regret that he should take as a criticism a question which occurred to several who heard his valuable paper read. Since our editorial was written we have laid out curves from the data given in the paper, but as the indicator cards used in his calculations are not given, the numerical values differ somewhat from his results. Further, as the effect of inertia, in high compression engines modifies the curves without changing their general shape, we cannot see how a short calculation would show whether the inertia had or had not been considered, unless exact indicator cards were given. Mr. Barr's letter, however, settles the matter, and will remove any doubts that existed as the result of a lack of explicit statement in his paper.

The Trunk Line Presidents, with their Western allies, have discussed the dressed beef question a whole day this week, and their subordinates are still wrestling with it; but no two men view it in the same light, and no agreement has been reached. The award of the arbitrators apparently would have been accepted long ago but for the fact that the Grand Trunk has continued to pay a cent a mile for cars, on the plea that it was hindered in getting the advantage of this rebate at the beginning and so was entitled to an equal delay in giving it up. The mileage rate is, in fact, the "rockiest" snag in the whole muddle, and the Trunk Line meeting has now voted to make the rate 1 cent a mile west of Buffalo and Pittsburgh, and ¾ cent east of these termini. This is evidently a temporary compromise, but even this has not yet been agreed to by the Canadian roads. The tariff rates continue at 45 cents to both New York and Boston, but it is hoped that some agreement will be reached soon. The dressed beef movement averages probably 100 cars a day out of Chicago. When this is divided among six or eight roads (each of these getting only about one-half of the 1,000-mile haul) the total net earnings accruing to any one company is found to be not astonishingly large; and the time spent in wrangling *may* come to be worth more than the results promised, though the railroad men probably do not spend nearly so much brain power on the subject as do the press reporters.

In our note on the arbitrators' report, Jan. 23, we did an unintentional injustice to the Canadian roads. By hastily adopting an erroneous mileage found in an authority usually correct, we made the distance from Chicago to Boston and back via Montreal 3,050 miles when it should be 2,360 (average of the two routes). The receipt per ton per mile was thus made 5.1 mills when it really would figure out about seven mills. But the weight of the ice and the extra weight of a refrigerator over an ordinary car, which we left out of the calculation, are so important that the error in mileage is, after all, more than offset by our too liberal omission. The ice generally adds 12 per cent. to the weight of the load; this reduces the actual receipt per ton per mile from 7 to about 6.2 mills. An empty refrigerator may be regarded as a common car carrying constantly five tons, at least, of "dead wood" (equal to ten tons one way) so that our 6.2 mills is received, not for hauling $\frac{1}{15}$ of 15 tons (which the beef weighs) but for a weight which, to be compared with the usual basis of cost, must be regarded as $\frac{1}{15}$ of 25 tons; so that the actual income is far below a half cent a mile instead of 33 per cent. above it.

Private cars for division superintendents are among the things which, according to a newspaper item, the Union Pacific has just abolished as too expensive. It is said that the new General Manager found 26 officers' cars in use, and that about a dozen, altogether, will go out of service. A special car, with a porter, costs from $1,000 a year upwards—say $1,200 on an average—and the expense is not one to be lumped in with postage stamps or incidentals; but nevertheless it is not to be hastily concluded that money spent in this way goes wholly or even chiefly for luxury. The above figure includes only the maintenance of the car. The cost of hauling it in regular trains, or as a special, is to be added to that, but it is to be remembered that this last item will be just as necessary under the new régime as under the old. A superintendent with 500 miles of road to look after—and, so far as we can judge from the *Official Guide*, some of the men on the Union Pacific have much more than that—must very frequently travel by special train if he is to profitably employ his time (which is the company's money). For the best prosecution of his work he needs to be in at least a dozen places at once, and it is good economy to help him to approximate this as nearly as possible, or at least it is poor economy to hinder him without first carefully counting the cost. An officer can, of course, ride on one of the tender boxes, but the practical question is, Shall we adopt the old English notion (applied to locomotive runners), that a man will do better service in proportion to his physical discomfort, or the more enlightened principle that every additional facility will pay for itself in increased efficiency? A private car is justified only where it is needed either as a hotel or as an office, or both. A superintendent whose lines lie in a desert needs it to eat and sleep in; and one who has a very large division, with a great multiplicity of interests to be attended to by himself personally, finds his work greatly facilitated by an office on wheels, in which he can keep his papers arranged in an orderly manner. The Union Pacific officers seem, unfortunately, to be situated much like those of many other roads, both rich and poor. When earnings are favorable for a considerable period facilities are afforded without much sharp criticism of their costliness; and when money is scarce the conveniences are cut off by single strokes of large knives without any very careful consideration of local and individual needs. American railroad directors' moods do not change with quite the regularity of the tides, but they seem to go up and down with about the same certainty.

On another page appear letters on the matter of the Brooklyn Bridge, which those who take any interest in the discussion can read. Therefore we do not reproduce in this column what the writers of those letters say. Moreover, we will assume that any one who is interested in the subject has preserved or can easily refer to "Dot's" letter and diagram which appeared in our issue of Feb. 6, and we do not reprint them. These and other more or less pertinent matter appear in *Engineering News* of Feb. 14, where they, with much elaborate editorial discussion, fill about 3¾ pages. We shall not undertake any analysis of that discussion in which the writer assumes to prove the "utter impossibility" of doing what it is proposed to do by Leverich's plan or "Dot's" plan. The scornful epithets which adorn the discussion betray a mental heat which suggests the partisan and patentee rather than the scientific investigator. We are quite willing to let time and actual experiment decide whether or not the second Board of Experts was right in its conclusion that the headway of trains can be reduced to 45 seconds, probably to 40 seconds. It is well enough, however, to say a word about paragraphs 1 (a) and 1 (b) in Mr. Wellington's letter. Within the last week trains have been repeatedly switched from the incoming platform to the stub not only in 30 seconds, but in periods of from 28 seconds to 35 seconds. It does not seem unreasonable to assume that the movement can be made regularly in practice in 30 seconds. It is said that this movement must necessarily be slow because of the danger of running the engine into the bumper posts; but the tail tracks can be lengthened to any necessary extent by moving the crossing and platforms toward the east. This of course is not desirable if it can be avoided. Moreover, when the time comes, the switching can be done by cables and the engine movements entirely eliminated. The "impossibility" found in paragraph (b) disappears when "Dot's" diagram and movements are read correctly. That is, the B trains are started first, from the inner track. Thus the B train arrives on the tail track, clear of the switch (and of course still further clear of the crossing), 20 seconds before the A train starts to run down to the outgoing platform, and the "collision every 90 seconds" is purely imaginary. Finally, supposing any given movement is not made in the assumed time, there need be no collision: by interlocking the switches and using detector bars there can hardly be a collision, and in any case there can be no crossing collision of loaded trains. The worst that can happen is a delay to traffic, and a delay to any one or two trains will not affect the relative movement of following trains. Possibly it may be found impracticable to reduce the headway to 45 seconds in regular running; possibly it may be reduced to 40 seconds: but, at any rate, it can be so much reduced by a tail switching system as to greatly increase the traffic capacity of the bridge, and the necessary changes can be so quickly and so cheaply made that every reasonable man must admit the good judgment of the second Board of Experts.

### On Some Suggestions from Chicago.

The letter from Chicago concerning the magnitude of various leaks in railroad expense accounts, which appears in another column, is printed, not because the general statements and arguments which it gives are new or startling, but because the writer is in a position to know, and gives some definite figures to back up his ideas. Every one admits the very unsatisfactory condition of things, but not every one realizes how great are the evils that must be fought. As to the bad morals and bad business of paying commissions to foreign ticket agents, there can hardly be a question; and yet the sophistry of the arguments in favor of the practice is not apparent to all minds. They are very plausible. It is said, for instance, that a ticket agent in the East whose mind is, by commission payments, strongly turned toward the interests of a road west of Chicago, is often thereby made a better ticket seller for his own road than he otherwise would have been, and that many roads are enjoying the services of ticket sellers worth $75 a month, while the salary paid is only $50. Much stress is also put on the argument that commissions are paid to keep agents neutral; but it is hard to see what good can result from a system that deliberately encourages blackmail and makes scalping easy. So long as the railroads cannot trust each other to act honorably the ticket commission practice will be hard to eradicate; and we are not sanguine of the immediate success of the efforts to stop it, while we agree with "Economy" that it ought to be stopped, not only for the reasons he gives, but for a more important one, to be mentioned later.

We are not so sure, however, about dining cars, because these cars are in most cases a real benefit to the public. Their introduction has so steadily spread and their use is so persistently continued, in spite of the great expense and care involved, that managers will hesitate a good while before making a radical change of policy. This is a question which must often be decided largely by local considerations. The number of trains on a line and the amount of the passenger traffic vary so much on different roads, that in some cases a well-conducted line of station restaurants would be so very much cheaper than dining cars as to warrant the indefinite postponement of the introduction of the latter. There is still a large field for the station dining room, and some of the thousands of dollars spent on dining cars might profitably be spent in improving the methods of cultivating this field; but where the cars have once been established, it would be a risky proceeding to take them off, even if there were no competition.

We would not belittle these or any of the other economies suggested by our correspondent. All of them are important, and some of them could be secured without injury to the quality or the quantity of the service given to the public; and this last is a vital consideration. No economy can be permanent which does not ultimately benefit the public. But reduction of cost of conducting business is but one function of the Western Traffic Association, or of any other combination of railroads, and not the most important function. Its greatest service will be in preventing waste of revenue in rate wars and in all the complicated and devious methods of rate-cutting. This is the biggest kind of a task, and it can only be done if the roads work together in good faith, and in no other way short of consolidation. But there cannot be good faith so long as rate making and rate breaking are left in irresponsible hands. The presidents and general managers of the railroads must actually control them, not only in the financial and operating departments, but in the

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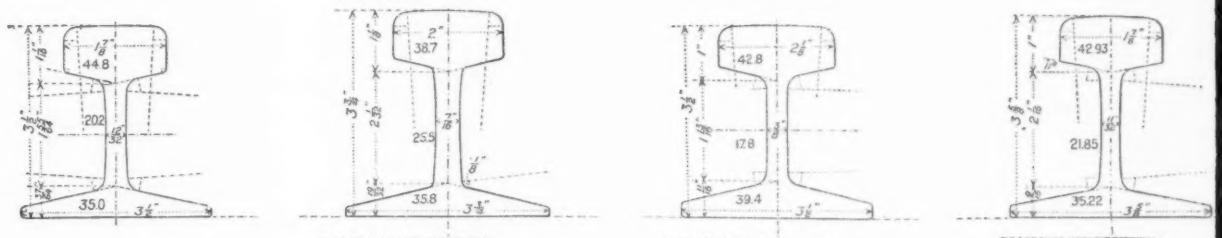
40-LB.

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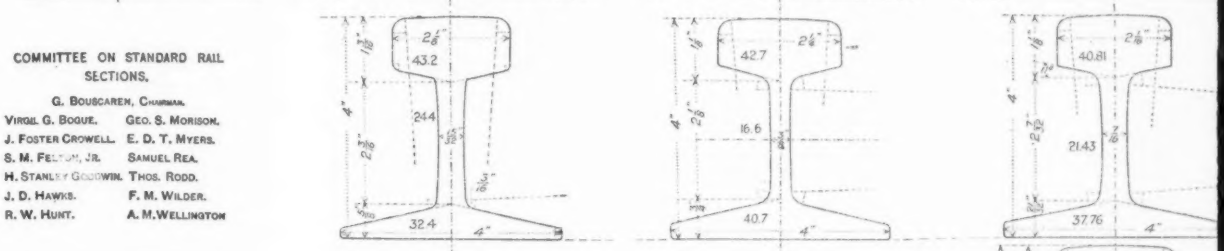


**COMMITTEE ON STANDARD RAIL SECTIONS.**

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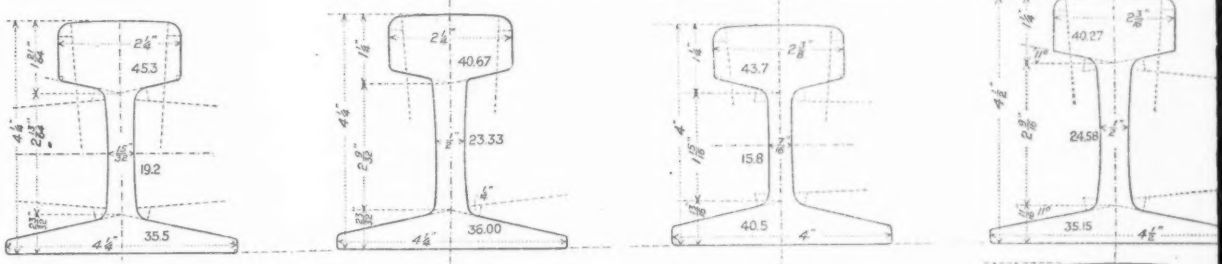


**EXPLANATORY NOTE.**—The several designs for sections of any one given weight are in horizontal rows; the several designs by each member of the Committee in vertical columns.

The dimensions which are common to the sections of all weights in each set of sections are shown on the 100-lb. section only. The dimensions which are not common to all sections are the only ones shown on the sections lighter than 100 lbs.

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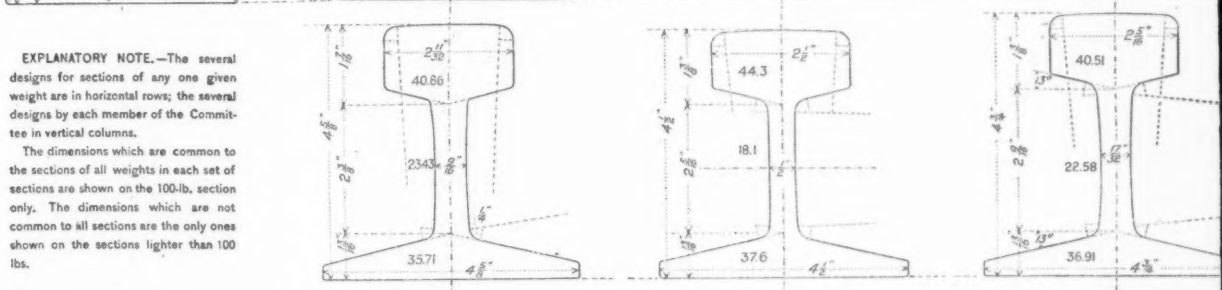


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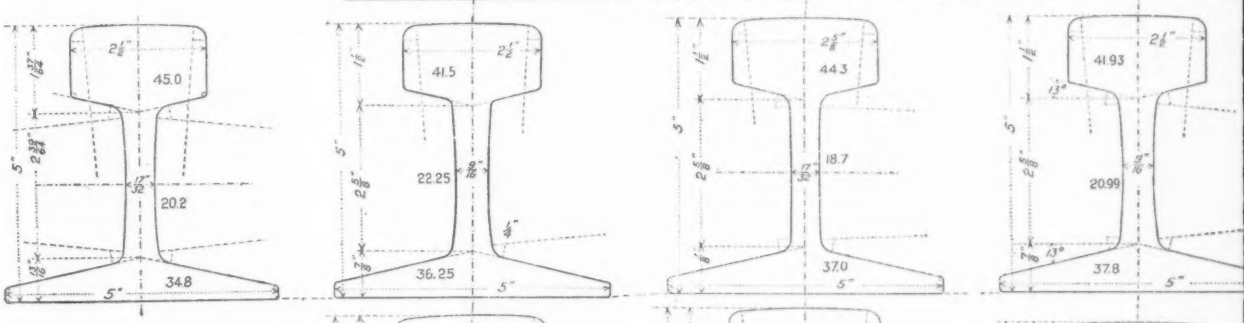


**The percentage of metal in head, neck and base is shown by upright figures on each section, except in the two sets of sections (Messrs. Morison's and Wellington's), which make these percentages uniform throughout. The latter have the percentages given on the 100-lb. sections only.**

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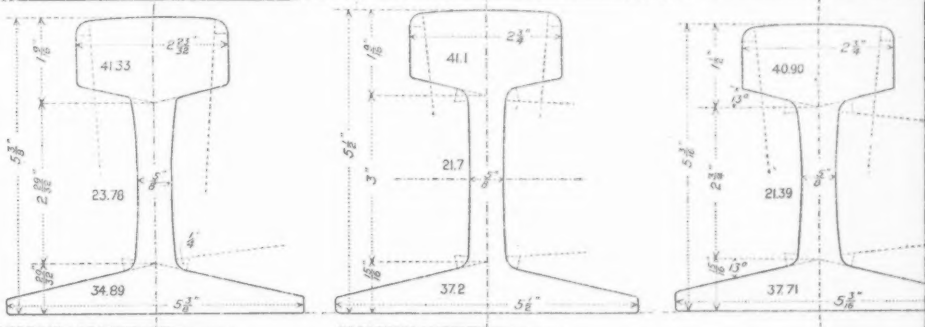


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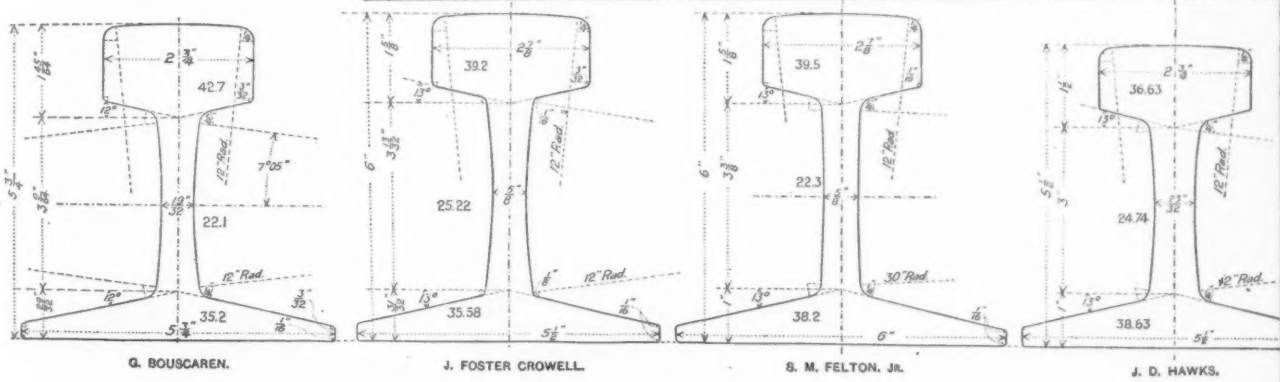


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## PRELIMINARY DESIGNS BY THE INDIVIDUAL MEMBERS OF THE

PREPARED UNDER RESOLUTION OF THE COMM

R. W. HUNT. | GEO. S. MORISON. | E. D. T. MYERS. | SAMUEL REA. H. STANLEY GOODWIN. | THOS. RODD

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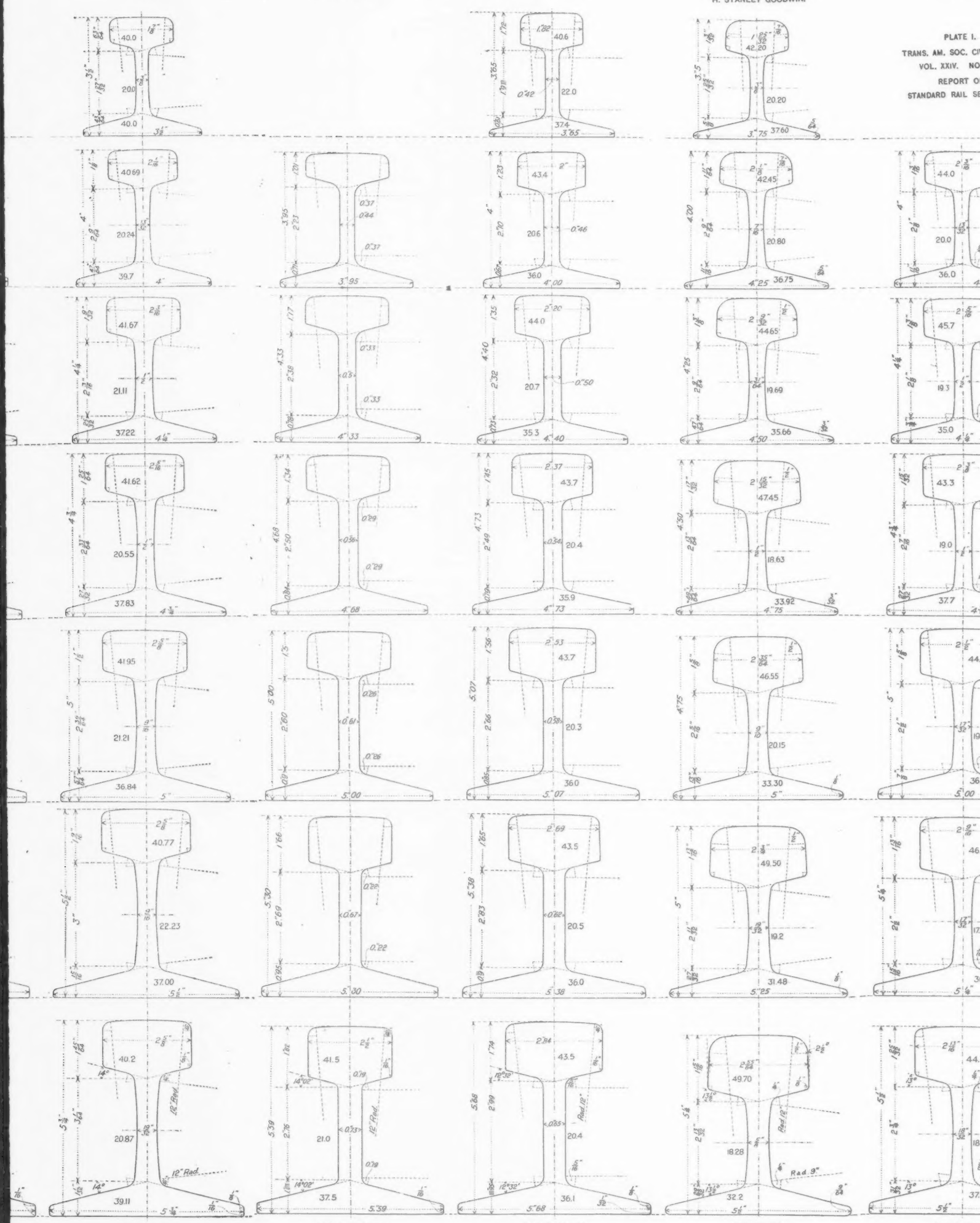



R. W. HUNT. | GEO. S. MORISON. | E. D. T. MYERS. | SAMUEL REA. H. STANLEY GOODWIN. | THOS. ROD

AM. SOC. C. E. COMMITTEE ON STANDARD RAIL SECTIONS, SHOWING SECTIONS VARYING FROM 40 LBS. TO 100 LBS. PER YARD.

ITTEE AS AN EXPRESSION OF THE INDIVIDUAL PREFERENCE OF THE SEVERAL MEMBERS PRIOR TO ANY DISCUSSION IN COMMITTEE.

THOS. RODD.

A. M. WELLINGTON.

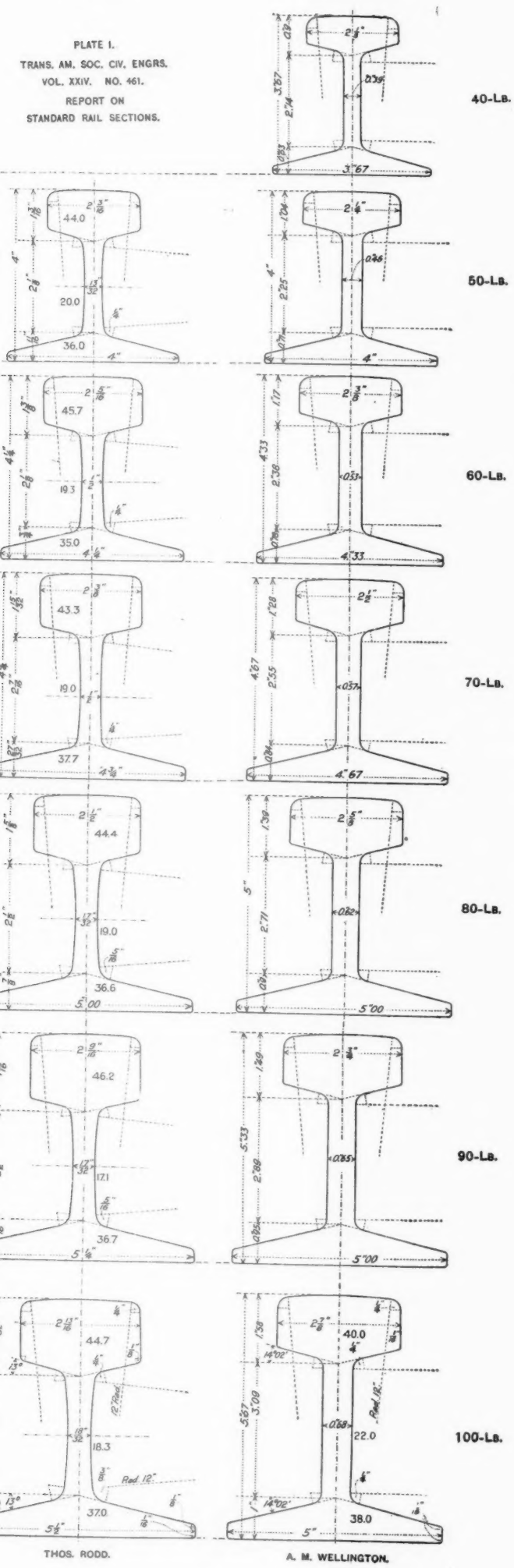
PLATE I.

TRANS. AM. SOC. CIV. ENGRS.

VOL. XXIV. NO. 461.

REPORT ON

STANDARD RAIL SECTIONS.




THOS. RODD.

A. M. WELLINGTON.

traffic departments. They must know what is done by the traffic men, and be responsible for their actions. This sounds like a commonplace. It seems superfluous to say it; and yet the last year has seen instances of railroads carrying traffic at less than cost and not knowing it; of cuts and rebates and special contracts made by traffic officers without the knowledge of their superiors, who were satisfied to see great volumes of business and big gross earnings. More than one instance could be mentioned in which managers and presidents have been deliberately and repeatedly deceived by their own traffic agents, even when they themselves wished to stand by the association agreements, and thought that they were doing so.

This must be so while traffic arrangements are left to the uncontrolled management of men who are "smarter" than they are honest, and who think that all sorts of racecourse tricks are legitimate so long as they get business. We do not say that all, or even a majority, of traffic agents are trickey; but we do say that the fierce struggle for business at any cost, and the want of strict and firm control of the traffic men by the highest officers, and the lack of intimate knowledge by the highest officers of the methods of their subordinates, have bred up a class of traffic men who are extremely able in their own way, but who are incapable of inaugurating or even following any enduring or far-reaching policy of building up permanent business by the best service to localities and by carefully adjusted, but paying, rates. Until this is changed, until the higher officers take these matters into their own hands and hold them there, there cannot be that mutual confidence which must underlie a lasting and effective association for maintaining rates. So, while great economies may result from the abolition of ticket commissions and the establishment of joint agencies, the best results of these steps will be in making crookedness harder and concentration of responsibility easier.

## Cost of Railroads and Railroad Service in England.

In one of Charles Reade's novels a shrewd Yankee sums up his opinion of English courts by saying, "They sell you justice prime but dear." Somewhat the same thing is true of English railroads, and especially of English freight transportation. Many of our correspondents have of late been discussing whether it would not be worth while to sell the transportation a little less high in quality at a great deal less price. We fear that the conservatism of English business will prevent reform in this matter for the same reasons that have prevented similar reforms in judicial administration.

The high cost of English railroads, while not the direct cause of high freight rates, is important as an indication of the methods which prevail throughout England and of the demands of the English public. It is not true, as Mr. Booth thinks (see his letter on another page), that the English roads cost more, because they do more work. There is no additional performance which at all corresponds to the added cost. Their density of traffic is greater than ours, but it is not nearly so much greater as Mr. Booth assumes. The English roads have cost in round numbers $200,000 per mile, the American roads $50,000 per mile. (As we have explained often before, the ordinary figure of $60,000 is obtained by counting certain stocks and bonds twice over.) The English roads do not have four times the density of traffic of American railroads, or anything like it. The tons *received* per mile of line are just about four times as great as the figure for the United States, being in round numbers 15,000 for England and somewhat under 4,000 for America. But density of traffic depends on ton mileage rather than on tonnage; and while the English railroads give no direct figures of ton mileage, we know with certainty that the average distance each ton of freight is hauled is less than half that in the United States, and probably only about one-third; some estimates place it even lower. Thus the tonnage moved over a mile of line in England is certainly not twice as large as in the United States, and probably not more than one-third or one-half larger; for density of traffic is proportionate not to tonnage, but to ton mileage.

Even if we look at figures of train mileage, we meet the rather surprising fact that the English roads do not do enough more work to pay for their additional cost. The aggregate capitalization of the railroads of the United States on June 30, 1889, as given in the Interstate Commerce Commission report, excluding duplicated stocks and bonds, was $7,367,000,000. The capitalization of English roads at the corresponding date was £877,000,000, or $4,200,000,000. The train mileage for the same period of the United States was about 725,000,000, the figure of 660,000,000 in the Interstate Commerce Commission report being based on the operations of 7,000 miles less of line than that which forms the basis of the capitalization. The English train mileage for the same year was 303,000,000. The English railroads, therefore, with a good deal more than half the aggregate capital, had a good deal less than half the aggregate train mileage, although their loads, for freight at any rate, averaged much lighter. The same thing may perhaps be more clearly put in another way. The American train mileage represents an average of not quite seven trains each way per day. But the roads of England, to run three times as many trains, cost four times as many dollars. How little this difference in cost can be justified by density of traffic alone may be seen by comparing the Boston & Albany Railroad with the average English line. The Boston & Albany runs about eighteen trains each way per day, or nearly as many as the average of the English lines; and its trains are so much heavier that the actual density of traffic is greater rather than less. Yet the Boston & Albany, running through a country which is in parts extremely difficult, and built on a high standard of excellence, has cost less than $100,000 per mile of line owned; not half the capitalization of the English railroads.

To some extent the high cost of roads in England is due to the enormous expense of terminals in crowded cities. Thus far it is legitimate. To some extent, though less than some people suppose, it is explained by the Board of Trade requirements. But the real reason for much of the cost lies in the action of stronger authorities and wider interests than those represented by the Board of Trade. The landed influence in England has been so great that it has imposed enormous charges on the railroads for real estate. The existence of a well-established system of common roads whose rights were jealously guarded by the public has put them to even greater expense in the avoidance of grade crossings. The last point has had its advantage to the railroads as well as its disadvantage; but the item of land damages has often amounted to nothing less than blackmail at a very heavy rate. It has not taken the form of corruption of individual members of Parliament; it has been the buying off of a class rather than a specific set of individuals, but from the standpoint of railroad economy and railroad development it has been in the highest degree disastrous.

But why, it may be asked, granting all this, should these things have any direct effect on freight charges? In the United States the roads that have cost the most have low freight rates rather than high ones. Why should not the same thing be true in England?

Because many of these items have caused added expense to the railroads without added economy—in some cases with actually lessened economy—in handling freight traffic. Where an American road has put more money into its permanent way and stations, it has been able to handle a larger traffic at lower rates. Where high cost has been incurred for additional tracks, it has been followed by the superior facilities for dealing with business and the consequent advantage in developing a large traffic. But where the same money has been spent in England for the avoidance of grade crossings no such result is certain. Avoidance of grade crossings may mean increase rather than diminution of grades, especially when the railroad is forced to go above or below ground rather than to depress or raise the roads previously existing. Not merely is this a large expense at the outset; it may also operate to prevent four-tracking. The cost of duplicating a viaduct or enlarging a tunnel may be very much greater than the cost of laying two new tracks on level ground, side by side with the old ones, especially if the public is in a position to charge enormous sums for the right of way. Of the special elements of expense of English railroads, it may be said that, so far from improving railroad economy, they actually interfere with it.

Occurring as these things do in a country with large passenger traffic, the English railroad companies have reason to give more attention to passengers than ours, and relatively less attention to freight. Nor are these the only reasons for this result. Water competition acts at so many points and with such great advantage that the railroads are deprived of a great deal of the freight which they could carry cheapest; especially are they hindered in the development of long-distance freight traffic. Although a large part of the English freight traffic consists of minerals and low grade goods, the percentage of high class freight is, nevertheless, undoubtedly higher than in most other countries, and the percentage of short-distance freight vastly higher. For these reasons, it is not fair to compare English railroads with those of the United States as a whole. They may be more properly compared with those of New England, where the conditions are much more nearly similar, and where the American charges are a good deal higher than the average. The New York, New Haven & Hartford road has a freight business not unlike that of the typical English railroad. It does its work somewhat cheaper than the English roads, but not very much cheaper; probably at rates on an average from 10 to 30 per cent. lower for the same classes of business handled under the same conditions.

So far as these causes are in operation, the English managers are not to blame for the relatively high freight rates; but they cannot relieve themselves of the whole burden. There is a residual difference which cannot be accounted for in this way, except so far as these outside conditions have withdrawn attention from freight economy and freight traffic policy. The arguments advanced to explain some of the differences in English rates carry their own refutation with them. To say that, because traffic is denser, expenses and rates may properly be higher is a confession of administrative incompetency. It means that the men in charge of the business would have been qualified to deal with trade as it was fifty years ago, but are not equal to the exigencies of modern business. Take the claim in the most plausible shape in which it is presented—the claim that the terminal expense of English roads is necessarily enormous owing to the crowding of traffic. Have English railroad men tried to deal efficiently with this matter of terminals? By no means. Until recently only one company, the Northeastern, succeeded in getting rid of private ownership of freight cars. On the majority of lines the mass of business was done in "private wagons." Nor has this difficulty been wholly exterminated as yet. Any railroad official knows the loss of economy in space, in time, and in administrative efficiency due to the attempt to handle business in cars which the railroad does not own and can but imperfectly control. Yet the English railroad officials for half a century stood perfectly supine in the face of this difficulty. The public preferred, or seemed to prefer, old ways of doing business. The officials were not strong enough to institute a reform, even in a case where the special circumstances most urgently demanded a change in just this particular. We give this as a symptom of the way English freight business has been treated. It has some importance for its own sake; it has a still greater importance for what it indicates as to the general policy which has prevailed.

We may sum up by saying that English freight rates are higher for three reasons, two of them due to outside conditions, the third at least partly due to the railroad managers themselves. In the first place, the tracks were made more expensive for reasons which hindered rather than helped the development of traffic. In the second place, the cheaper grades of freight traffic, and especially the long-distance freight traffic, were so largely subject to water competition that neither the railroads nor the public had the vital interest in securing that development which would otherwise have existed. In the third place, as a result of these conditions, little progress was made in business methods; the railroads being content to develop traffic more slowly and at higher rates than has been the case in the United States, or than would have been the case in England under more favorable outside conditions.

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A report has appeared in the newspapers to the effect that a gas tank under a Pullman car in the yards of the Central Railroad of New Jersey at Jersey City exploded recently during charging. It appears on inquiry that there was no explosion of the tank, nor was it injured in any manner. An obstruction in the pipes had been observed several days before the accident, and an attempt was made to clear this obstruction by sending gas through the pipes. This was done by opening the burners in the car and forcing the gas through under pressure, the regulator not being used. The men neglected to open any windows in the car, which consequently was filled with gas, and eventually this was ignited, by the fire in the Baker heater, according to one theory, or, according to another, by a lighted match. The damage done was entirely to the woodwork and windows of the car, and the accident was not due in any way to defects in the gas system or its attachments. The extreme improbability of the destructive explosion of a gas cylinder under a car will be apparent to any mechanic. In the first place, it is probable that some of the connections would first gave way, and in any case the least rupture would be followed by a sudden fall of pressure. The conditions are entirely unlike those obtaining in a boiler explosion, where the water is instantly converted into steam as the pressure is reduced.

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"Proposed legislation concerning railroads" is a title under which we might readily fill up each issue of the *Railroad Gazette* nowadays, the exchanges from the various state capitals furnishing the material ready prepared for the paste-editor; but as all of the hundreds of bills are cast in the same mold, and as none of them have yet become laws, we spare the reader's patience. One or two items vary slightly from the otherwise universal tone. In Kansas a minority of the House Railroad Committee have prepared a strong report objecting to

the maximum freight rate bill. In Texas a bill, favorably reported, requiring separate cars for blacks and whites provides that "trains may be exclusively for whites or negroes, into neither of which any of the opposite color will be admitted." To run separate *trains* for the races would be a really beautiful scheme—for the race that took the second bite of the cake. In North Carolina, where the Farmers' Alliance controls the legislature, a sweeping bill giving an elective board of commissioners arbitrary powers will doubtless soon become a law. In Illinois and Kansas railroad officers quite generally express the expectation that two-cent passenger fares will soon be ordered by the legislatures.

Manager A. M. Simmons, of the Cleveland Car Service Association, has issued a report for January, showing the average detention of cars to have been 1.78 days, as compared with 1.74 days in December. The association which takes in a dozen stations outside of Cleveland has handled 441,424 cars since its organization in November, 1889. In addition to the statistics usually shown, Mr. Simmons gives the percentage of cars released within 48 hours (in December 72 per cent.), and shows what part of the detention is chargeable to the roads, and what to consignees or shippers. Of the 1.78 days just noted, .68 was by the roads and 1.10 by customers. Nothing is said about "company's freight," so we assume that the .68 represents the time that elapsed from the time of arrival of the cars to the time they were placed on team tracks. It is specifically stated that detention is computed from the hour of arrival. On coal and coke two days' "storage" is allowed, in addition to the usual free 48 hours; but these commodities are nevertheless included in the average of detentions.

The American Association of General Passenger and Tickets Agents at its meeting in Chicago this week took significant action looking to the abolition of a large share of the unlimited ticket rates which now cumber all the joint rate sheets of the country, and in many sections afford the scalpers a good chance to disturb revenues. We do not see how there can be, in any considerable territory, a complete abolishment of unlimited rates for joint tickets, such as the passenger men speak of in their discussions, but there is certainly room for a decided reform, and a committee was appointed by a large vote to take vigorous action. The scheme for representing each road in the country by a number, which has been heretofore discussed and which has been already carried out, conditionally, by printing a list of roads, with numbers, in the *Official Guide*, was formally approved. It will be remembered that one of the objects of this plan is to print the number of the road in bold type on the face of all coupons to be honored by that road and upon the back of all coupons issued by it.

The Cincinnati, Wabash & Michigan road has in use a somewhat peculiar form of "week-end" round trip ticket, the conditions of which are so worded that if a holder concludes not to use it within the time limited he can make the ticket available for an ordinary unlimited passage. The essential feature of the scheme is to sell the ticket at the same price as a regular unlimited round trip ticket, but with conditions in the contract to the effect that if used between noon and midnight Saturday, going, and between midnight and noon Monday, returning, the difference between the regular round trip rate and the week-end round trip rate will be refunded on return of the contract to the agent selling it. The signature of the purchaser is required and there is a "punch-photograph" in the margin. This form is said to be popular with passengers. One can buy his ticket several days in advance, if he likes, or can stay beyond the limit he had intended without incurring inconvenience.

It will be interesting to those who have watched the performance of the Schenectady compounds in use on the Michigan Central to know that the first of the two engines furnished this road, No. 284, has been doing good work in passenger service. Recently she hauled the North Shore Limited from Detroit to Jackson, a distance of 76 miles, in one hour and forty-two minutes. From this time an allowance must be made for ten minutes used between Detroit and West Detroit, three miles, and a reduction of speed for one mile, running through the yards at Jackson. In addition to this there were a stop at Ann Arbor and slackening at Ypsilanti, to say nothing of the grades which were against her and the curves in this portion of the road. Estimating the slackening at Jackson and other points, together with the stop at Ann Arbor at five minutes, we have 76 miles in 97 minutes, or at 46.8 miles an hour. The train consisted of five heavy Wagner cars.

A press dispatch states that representatives of the Burlington, Union Pacific, and Fremont, Elkhorn & Missouri Valley roads called on the Nebraska Relief Commission at Lincoln, Neb., last week, and announced that their roads would no longer carry supplies free or at reduced rates for the impoverished farmers. This action is said to have been taken in consequence of the radical character of the restrictive railroad legislation now pending. This item may not be true, but it is in line with the letter of a correspondent, who sends us a copy of an appeal sent to railroads of the Northwest by the Farmers' Alliance of South Dakota. Our correspondent uses no harsh language concerning the farmers, and does not say that the appeal will be ineffectual; but he suggests a question as to the consistency of using force (through political channels) and entreaty (through private channels) simultaneously.

Heavy rains caused serious floods on Sunday, Monday and Tuesday of this week in the Susquehanna, Conemaugh and other rivers in Pennsylvania, extending to Pittsburgh and down the Ohio. Bridges were carried away at Johnstown and in the vicinity of Washington, Pa., and railroad traffic was suspended on many roads. The Pittsburgh & Western was badly flooded between Sharpsburgh, Pa., and Lower Allegheny, and considerable freight in cars was submerged. Landslides are reported from a score of places. Massilon and Steubenville, Ohio, and Wheeling, W. Va., reports indicate that the situation at those places is about as bad as in Pennsylvania.

The astonishing statement was made by a local paper and has actually got into some of the technical journals that Mr. L. L. Buck proposes to build a stone arch bridge across the Niagara River near the suspension bridge. It is hardly necessary to say that this is nonsense.

## NEW PUBLICATIONS.

*General Index of the Annual Reports of the American Railway Master Mechanics' Association.* From the First to the Twenty-third Report, inclusive (1866 to 1890). Prepared by Angus Sinclair, Secretary, 140 Nassau street, New York City.

By the preparation and publication of this index Mr. Sinclair has made available a valuable mass of mechanical literature. The index is by subjects, and is classified under reports, papers, illustrations, discussions and miscellaneous. Many cross references are made, but by carefully limiting the index to material of permanent value it has been kept down to 62 pages of very legible print. Copies may be had on application to Mr. Sinclair.

*Journal of the Association of Engineering Societies*, January, 1891. This issue contains papers on Electric Industries in St. Louis; Lake Currents, and the Proposed Opening of the Breakwater at Cleveland; and Comparison of English and American Types of Factory Construction. It contains also a memorial of Mr. Thomas Jefferson Whitman. Copies may be had from the secretary, Mr. John W. Weston, 78 La Salle street, Chicago, Ill. Price 30 cents.

## TRADE CATALOGUES.

*Ansonia Brass & Copper Co.*—This old and well-known concern has issued an elegant little souvenir consisting of a series of lithographic views of its various factories. The brass rolling mills, copper rolling mills, and lamp and wire works at Ansonia, and the shops of the Ansonia Clock Co., Brooklyn, make five large plants. The office of the company is at 19 Cliff street, New York City.

*The Thomson-Houston Electric Co.*, of Boston, Mass., has published an atlas containing, in the first part, maps of each state in the Union on which those cities and towns having central station electric light plants are indicated. The different systems are shown by different-shaped black marks, except the Thomson-Houston installations, which are represented by small red squares. In the second part are maps of the different sections of the United States, on which are shown the electric street railroads in the same manner that electric lights are shown in the first part. Every other page throughout the book, and a number in the front and back, contain advertisements of those companies manufacturing apparatus used by electric light, power and electric street railroad plants.

A list is given showing by states the number of installations of each system, and in the recapitulation it appears there are 1,985 central station electric light installations. Of course in many instances there are several systems in one plant, so that there are not 1,985 separate electric light plants. Twenty-five different systems are in use. There are 240 electric street railroad installations and 10 systems represented.

It would have added interest and value to the atlas had the arc and incandescent systems been given separately with the total number of lamps of each kind in use, and also the number of miles of electric street railroads and number of cars, but it would certainly have been an immense undertaking to get such a mass of information from so many people and still have it reliable.

## Painting and Varnishing of Railroad Rolling Stock.

At the February meeting of the New England Railroad Club the above subject was discussed. The discussion was opened by Mr. Charles Richardson, who read a paper which is given in part below.

Mr. Richardson: The quality of material used is more important than the price. Many of the articles, such as oil and varnish, should be bought in large quantities, allowing them time to become well settled before using. All material should be pure and finely ground. The mixing or the preparing of paint, as far as practicable, should be in the hands of one person, who should weigh and measure each article, rather than guess at quantities. Always use pure linseed oil. A poor pigment with pure linseed oil is more satisfactory than pure pigments with adulterated linseed oil.

It sometimes happens that certain things may be established in the painting department or the laboratory, and work satisfactorily there, under cover, but outside you get quite different results. The chemist can give you points as to the mixing of colors, what colors are harmonious, which have an affinity for others. Your colors may fly, or spot, or be striped, on account of chemical action which takes place when they are combined with lead. I notice that Dr. Dudley is in doubt whether pure lead is the best to mix colors with under all circumstances. In cases where the painting proves unsatisfactory, you may find on examination that when pure lead and pure linseed oil are mixed, there is perhaps oxidation, or a soap-like substance is formed on the surface, which has a tendency to wash off and leave the pigment without anything to protect it, or tracks will form, through which the water goes, and the paint has a tendency to wear off more rapidly. From some experiments made some years since by an expert painter with different colors, where pure lead was combined with pure zinc, also with zinc and barytes, also with zinc and silex, in mixing the paints, with perhaps other combinations, it was found that strips of wood, painted with different colors, with these different combinations, on being exposed to the weather for several months and carefully watched, showed different results, that certain colors changed more than others; and we concluded that the deterioration was perhaps due to the fact that the acid had not been properly washed out of the lead in the process of manufacture. The pigment with which you mix your paints is a very important factor, and if a chemist would give you the facts as to what colors are most desirable for use it would be of great service to the painters and to the roads.

What we want to aim at in this matter is practical economy, not the penny-wise and pound-foolish kind. It is of much importance that the first painting of a car be properly done. Some years ago I painted two cars in different ways, and took note of the cost of each and the expense in this line in running them for ten years. I found that the car I painted cheaply cost more money during that time than the car I painted well. One of the greatest causes of injury to cars is in hurrying them out of the shop too soon after they have been varnished; some parts of the work can be hurried without injury. That is one reason why cars which are painted in light colors are often so distasteful to look at. It is very important to get the varnish thoroughly dry and hard before it is exposed to the weather.

Mr. Worall (Boston & Maine): In varnishing cars, in order to make the work lasting, the varnish should be well rubbed in. When the varnish is put on it dries porous, and if those pores are rubbed out the work will last longer; but if you put on coat after coat, without rubbing, it will not last long. Of course, it requires time to rub the varnish in, but it will pay.

Mr. Nelson (New York, Providence & Boston): I am old-fashioned enough to stick to the pure lead and oil. I remember that years ago we gave the preference to English lead, because the acid was more thoroughly washed out of it than from American leads; the English gave more time to its preparation. I should say that for house work the lead may be adulterated for the last coats; but for the foundation coat pure lead and oil should be used, worked into the grain of the wood; after that, zinc may be used to adulterate. I have nothing to say in favor of barytes. If you can dry zinc paint without cracking you will get a most durable paint. I would like to ask Mr. Brown if he ever adulterates his lead with zinc or anything else.

Mr. Brown: I have never made any attempt to adulterate paints. If there is any adulteration when I receive them, I have no control over that. We had a material some years ago which was called lead, but it was not sold as pure lead. What there was in it I cannot tell; but the cars that were painted with that material gave us better service than those upon which anything else was ever used. It dried harder and firmer, cracked less, peeled off less than any other material we ever used; you could sand-paper it almost to a polish. The cars painted with this material were in service a long time before they required repainting. I find the pure lead we get is of a soft, porous, absorbing nature, and the first coat of varnish we put on almost goes out of sight; I don't know as it is any particular injury to the varnish. On the cars painted with the material I just spoke of, not pure lead, the varnish stood out better, showed better results with two coats of varnish than were shown with three coats where pure lead was used.

Mr. Curtis: Do the lead and oil we send you run pretty even, or, as Mr Hibbard suggests, is it one time pure oil and poor lead and another pure lead and poor oil?

Mr. Brown: We find a variation in the condition of it in the way it is ground, fine or coarse; sometimes it is very stiff, like old, dried putty, and requires considerable manipulating to get it of the right consistency to work.

Mr. Curtis: I would like to ask Mr. Richardson if the lead and oil do not run fairly even? Is there any particular reason why a manufacturer should not present his lead and oil about the same every time?

Mr. Richardson: There is a chance for variation. It comes in the manner of corroding; some lead is corroded better than others. Within a few years all the lead corroders have been absorbed by the Lead Trust. Since the Lead Trust was formed they have changed their system of grinding lead; they claim the new process is better. Since the Lead Trust was formed their effort has been to give uniformity to the lead, and although it is stenciled in different ways it is all the same product. The lead that Mr. Brown referred to as not pure lead is made of one-third pure lead, one-third pure zinc and one-third silex. We have sold that lead since 1865, and we have always sold it with the understanding that it was a combination; it was a patented article, and we bought the right to make and sell it. I will stake my reputation that that will give more satisfactory results, as a rule, than any pure lead that is made. It gives a better surface for the varnish. That combination overcomes the chemical action that results where pure lead and oil are used, particularly on the sea shore.

Mr. Marden: There is a point which has not been touched upon, the manner in which the cars are taken care of after they leave the paint shop. If some way can be devised to make the varnish on a car last two years it will be a great benefit to the roads. Cars can be cleaned in such a way as to kill the varnish in a month after they leave the shop.

Mr. Walton (New York, Providence & Boston): Many cars are spoiled in the yard by not being properly taken care of. At one time I went through the yard of our road and found a man washing the cars with boiling water. At another time a man said he had a new idea about washing cars; he said he used ammonia in the water he washed the cars with. After awhile the cars began to look bad. I have always advocated light colors for cars; the varnish stands out better, and they are

easier to clean. I would like to ask Mr. Richardson what color he would paint cars to wear.

Mr. RICHARDSON: My view would be to paint them light color. The varnish holds better, and light colors wear better than dark.

Mr. MARDEN: In painting passenger cars we give first a light coat of lead and oil, and then lead and oil and japan; we use the lead and oil in three coats; then we apply, I think, three coats of the Pullman standing color, and we allow not less than three days between each coat of varnish. I would like to know whether three coats of finishing varnish, or one, will give the best results as to durability. I think that dark colors draw the heat more than light colors; but I think the difference in colors is hardly worth considering.

Mr. BROWN: I would like to ask Mr. Marden if in varnishing the cars on his road the varnish is rubbed?

Mr. MARDEN: It is not; we sand paper only, or use curled hair. We do very little surfacing on our coaches.

Mr. BROWN: That is one point where durability is lost. It is a decided advantage to rub the varnish. Mr. Worell spoke of varnish drying porous. My experience has been that two coats of varnish, the first rubbed in, give better satisfaction than three coats without rubbing. It is time and money saved to rub your varnish, even if you do not rub it thoroughly. A very little rubbing helps fill up the pores. With regard to the care of cars after they leave the shop, I think it advisable to have a practical painter in charge while they are not in service. One ignorant and careless man can abuse the cars more in one hour than a dozen men could repair in many hours. I am in favor of dark colors, say the Pullman color, which makes the cars look neat, tidy, rich; it shows the presence of dirt less than lighter colors.

Mr. CURTIS: How much time do you allow to put a car through the paint shop?

Mr. BROWN: I should not want to turn out a car in three weeks; eight would be much better. After the first painting a car should not be exposed to the action of the weather for more than ten months, and then should be taken in and cleaned and revarnished, and it will give two years of good, honest service, and be better then than at the end of the first ten months.

Mr. ADAMS: There is no question that Mr. Brown is right in regard to the time required. I remember that one time we had a car painted and finished up, and, for some reason, it stood in the shop several weeks, I think not less than eight, so that it got thoroughly dry, and the paint was hard. It was in service two years before it come into the shop again, and when the varnish was washed off it was in as good condition as cars ordinarily are that have run only ten or twelve months. I think ten weeks should be allowed to paint and get out a car.

I have advocated for years the painting of passenger cars white, and I understand that two trains are to be put on the N. Y. & N. E. road painted a pure white. Their durability will be increased; the heat will affect them less; properly put on and taken care of, white paint will last longer than any other—I think one-third, perhaps one-half. Take a white-painted car, with a fine blue and gold stripe, and it is a most beautiful thing; these colors blend together harmoniously.

Mr. COUGHLAN: The cars of the London & Northwestern are generally painted white above the sill. No painter of railroad cars in England would ever think of turning a car out in less than three months, and no varnish maker will guarantee his varnish to stand with less than six weeks' drying. Such cars last three or four years without re-varnishing. After the varnish is thoroughly hard, they put over the last coat a coat of raw linseed oil, out of which all the fatty material is taken, after which the cars are allowed to remain eight hours, and then they are rubbed down to a polish with a fine cotton cloth, and the pores in the varnish, which are caused by the volatile matter in the turpentine, are completely filled. The protection lies in the oil being absorbed entirely. Another practice is, before they put on the two last color coats, they give the body a coating of raw linseed oil, which is to dry for not less than twelve days, the result being that there is no absorption of the varnish at all; the surface is completely filled up and the varnish has no pores; it is rubbed down afterward. There being complete protection inside, all the varnish has to do is to protect itself. This English mode of treatment is expensive, but it pays in the end. Three years ago I had some of the cars on our road treated in that way, and the varnish is in good condition to-day, after three years' service, notwithstanding the exposure to the salt air. Those cars are in better condition than cars treated in a different manner that have been only one year on the road.

Mr. LANG: The only argument in favor of light colors for cars is that they will not absorb the heat like dark colors. You have to put on more paint to cover your surface than with dark colors, and that requires more material. I think that our experience has proved that dark colors are the best. I have always striven to get pure lead, but it has been demonstrated here to-night that adulterated goods are the best. That I never took any stock in, and I do not now. We have had our colors made at one place; they work all right, and give perfect satisfaction.

## Rigid and Swing-Motion Trucks.

At the January meeting of the Southern & Southwestern Railway Club this subject was discussed. Mr. Steinbrenner read a paper in substance as follows: Granting that the flange wear of rigid trucks be greater than that of swing-motion trucks, there would still be a sufficient offset in favor of the rigid truck in the difference of first cost. The record of flange wear of wheels in both kinds of truck, as shown in the experience with the American Refrigerator Transportation Company's equipment, indicates that it is the same for both; they have about an equal part of their cars equipped with each kind and the number of wheels removed on account of sharp flanges is about the same for each form of truck. The life of springs and draft gear is materially shortened by the unnatural vertical movements and heavy rocking strains caused by the swing-motion truck, especially in passing to and from curves. It is believed that the swing-motion truck is the undiscovered source of many wrecks. Statistics taken from the A. R. T. Co.'s records indicate very much less cost of repairs for cars using rigid trucks than for swing motion trucks, the latter cars consuming about 80 per cent. of the total cost of maintenance for a period of five years. It is believed that with the addition of friction-less bearings and elastic springs, the rigid truck will be vastly more satisfactory as well as safer than the swing-motion trucks.

In the discussion which followed this paper, a feeling in favor of the swing motion truck appeared to prevail; nothing new, however, was developed.

## Cost of Steel and Steel Rails.

The President has transmitted to Congress the report of Col. C. D. Wright, the Commissioner of Labor, on the cost of production of steel and steel rails. For purposes of comparison Colonel Wright has divided this country into two districts, the various items of cost in each per ton of steel being given as follows:

| Items. | Northern district. | Southern district. |
|---|---|---|
| Establishments reporting | 26 | 24 |
| Cost of all materials used | $6,387,622 | $5,450,459 |
| Cost of all labor, etc | 1,199,918 | 1,515,995 |
| Cost of all elements | 7,587,540 | 6,966 454 |
| Tons of product | 544,377 | 647,728 |
| Average cost of all materials per ton of product | 11.744 | 8.414 |
| Average cost of labor, etc., per ton of product | 2.204 | 2.341 |
| Average cost of all elements per ton of product | 13.938 | 10.755 |

A comparison of the cost of materials used in the Northern and Southern districts of the United States shows that the difference in favor of the South in the cost of ore and of coal is very great, although the difference, so far as the ore is concerned, is partially offset by its comparatively higher per cent. of iron in the Northern district.

A comparison of the average cost per ton for the two districts is given:

| | Average cost in Northern district. | Average cost in Southern district. |
|---|---|---|
| Iron ore | $4.401 | 1.513 |
| Cinder, scrap, etc | 2.631 | 1.031 |
| Limestone | .798 | .701 |
| Coke | 3.014 | 3.084 |
| Coal | 2.695 | 1.566 |
| | $13.539 | $7.895 |

Another table shows the results of inquiries as to the cost of producing steel rails in thirteen establishments, two of them being in the United States, eight on the continent of Europe, and three in Great Britain. In the United States the net cost of materials was $21.10 at one establishment and $25.11 at the other. The cost of labor was $1.54 and $1.38; total cost at one $24.79 and $27.68 at the other. On the continent the net cost of materials varied from $17.69 to $19.88; the cost of labor from $1.02 to $4.64 per ton. In the three establishments in Great Britain the net cost of materials varied from $16.39 to $18.05; the cost of labor from $1.36 to $29.54. The totals therefore varied from $18.58 to $21.90.

Colonel Wright says that the labor cost in one ton of steel rails, after all the materials have been assembled and are ready to be subjected to the proper manipulations for the production of rails, should be less per ton relatively in this country than in Great Britain and the continent of Europe, because American producers of rails dispense with at least one expensive process still adhered to by many foreign producers, and materials in the United States are purer than those used in most other countries.

As an illustration of the practical working of freight rates with reference to steel rails, the report quotes the statement of the manager of one of the largest steel companies in the United States. He said that the difference in cost of production of steel rails in Chicago, for instance, and in England would not exceed $3 50 or $4 per ton, and that the freight rate ($5 per ton) from Chicago to New York offered a large protection to his company.

The same manager prepared the following statement as to the market value of English rails per ton in Liverpool, New York, Chicago and San Francisco in November and December, 1890:

| | Without tariff. | With tariff. |
|---|---|---|
| In Liverpool | $25 | $25 |
| In New York | 25 | 39 |
| In Chicago | 30 | 44 |
| In San Francisco | 25 | 39 |

Price of Chicago rails per ton at Chicago, $30; at San Francisco, $47.92, giving English rails an advantage of $6.92 over Chicago rails in the San Francisco market.

It has been stated that during a greater part of the season ocean steamers and vessels transport rails as ballast, and free of charge for freight, from Liverpool to New York or San Francisco. If it is true, the statements are of great importance.

As to the time workmen are employed, the report gives examples of daily averages in this country and in Europe in pig iron works. The average daily earnings of workmen in the Northern district of the United States varies from $1.47 to $2.03, in the Southern section from $1.22 to $1.34, on the continent of Europe from 64 cents to 70 cents, and in Great Britain from 62 cents to 67 cents. In Great Britain and on the continent of Europe, however, the workmen are employed only about three months in a year.

# TECHNICAL.

## Manufacturing and Business.

The Queen City Mfg. Co., of East St. Louis, Ill., has been chartered to manufacture railroad appliances and tools. The incorporators are: M. Wuerpal, Hermann G. Weber, W. H. Hill, J. D. Baker, W. H. Hovine, Sr., Paul W. Abt and A. H. Handon, Jr.

G. A. Christ, Assistant Chief Engineer of the Grand Rapids & Indiana, has invented a railroad cattle guard, and patents have been applied for.

Owing to the increase of business Byram & Co., manufacturers of the Colliau cupola, Detroit, Mich., are erecting an addition to their present plant, 50 × 40 ft., which is to be devoted to office and storage purposes. This will adjoin the present building on the east, and leave the present structure, which is 50 × 115 ft., to be used exclusively for shop purposes.

The Bucyrus Steam Shovel & Dredge Co., Bucyrus, O., has sold two of its large shovels to the Cleveland Iron Mining Co. and one to the Lake Angeline Mining Co. These shovels are made for handling hard and soft ore, and have a capacity of five tons per minute. It is claimed for them that they will load ore at about one-third the expense of band labor.

The name of the Baugh Steam Forge Co. has been changed to the Michigan Forge & Iron Co., of Detroit. Mr. W. C. McMillan has been appointed General Manager, but no other changes have been made in the officers.

The Norwood Car Replacer Co., of Baltimore, Md., will soon begin the erection of a factory in that city for turning out malleable iron. Plans of the building have been made, and estimates are asked from manufacturers for the furnaces, cranes, cupolas and other machinery. A superintendent for the works will soon be appointed.

The Michigan Railway Supply Co., Detroit, is building a new factory at the junction of the Detroit, Grand Haven & Milwaukee and the Bay City division of the Michigan Central. The structure is now under roof and it is proposed to finish the work by May 1. It is of brick, 300 ft. long by 75 ft. wide. The company owns six acres of ground on which the factory is located. With the completion of the building the company will have facilities for turning out 2,000 brake beams per day and also for the manufacture of its metallic grain door.

William Tod & Co., Youngstown, O., have recently added a forge department to their works, comprising a 3,150-lb. Sellers steam hammer, with cranes and heating furnaces. This addition will enable them to forge shafts or similar work up to 12 in. in diameter.

The frog, switch and signal department of the Pennsylvania Steel Co., at Steelton, Pa., is to be nearly doubled in capacity. The company has also recently started a bridge and structural department, which has been placed under the management of Charles E. Billin, who until recently was in charge of similar work at the Pencoyd Iron Works.

## Bay City Industrial Works.

The Industrial Works of Bay City, Mich., has recently shipped to the Union Pacific a steel car mounting two 15-ton capacity, very complete, cranes, which will be used at Salt Lake City, Utah, in wrecking and construction work. Wrecking cranes and cars of the same capacity have also been built for the Nicaragua Canal Construction Co. and the West Virginia Central road. The Lehigh Valley is erecting one of its 20-ton steel transfer cranes at Jersey City, N. J., and the Michigan Central has just started a powerful traveling crane at the Jackson (Mich.) shops, built by this company.

Among other recent shipments have been a standard steam shovel to the Mexican Central, at Tampico, Mex.; a pile driver to the Sioux City & Northern, and two steam jib cranes, steel construction, and of 10 and 25 tons capacity, to the E. P. Allis Co., Milwaukee, Wis. For this latter company a very powerful and complete steam track crane is also under way. This crane will propel itself, lift at different speeds, vary the radius of its jib, and slew its load through a complete circle, all with its own power. In addition a 10-ton power traveling crane for the new plant of the Marinette Iron Works, at Duluth, Minn., is about completed at the shops, and there is in process of construction one of the portable railsawing outfits for the Chicago & Grand Trunk. This consists of a steel car, boiler and high speed engine, cutting off-saw, double drill, hydraulic straightener, and the machinery for properly handling the rail in all of its movements. Another ponderous piece of machinery is a steel car some 48 ft. long, upon which is being mounted at each end a 20-ton steam crane and boiler, each complete within itself and entirely independent of the other. This outfit for the Philadelphia & Reading is intended for use at wrecks and for other purposes, and will be one of the most powerful yet constructed in this country. Two electric transfer tables, each 70 ft. long, are being built, one for the new Cheyenne shops of the Union Pacific and the other for the Denver Union Railway & Terminal Co. The Industrial Works, besides just finishing a considerable amount of special machinery for the East Tennessee, Virginia & Georgia Railroad, is engaged upon a large contract for dredging machinery, to be used upon government work on the Great Lakes, and several pile drivers, steam shovels and other tools, and the works of the company are quite easy.

## Buffalo Fans on the Corvette "Galena."

The Buffalo Forge Co. has furnished the government two of its blower engines for use on the above-named vessel to supply forced draft to the boilers. By the use of these fans the vessel will be able to maintain her present steaming efficiency while using fewer boilers. The engineering department of the Brooklyn Navy Yard tested these blowers and found them equal to the required capacity. They made 575 revolutions per minute and ran through the 7 hours' test without refilling of oil cups.

## An 80-Ton Testing Machine.

The *Revue Générale des Machines-Outils, etc.*, for November, 1890, contains a description, with two double-paged plates, of an 80-tonne testing machine (tonne = 2,204 lbs.) which presents some novel features. The machine is of the vertical hydraulic type. The press cylinder is below the level of the floor and the plunger, or piston, extends through both ends of the cylinder. The upper part of the piston is reduced in diameter, so that the pressure of the liquid is exerted on an annular area. The piston carries a large screw concentric with it, to the upper end of which the grip, which holds the lower end of the specimen to be tested, is fastened. The main beam of the machine is horizontal, and is supported by two cast uprights, which form the frame of the machine. The upper grip is attached to this beam, and a pan for weights is hung from the end of the beam, so that this portion of the machine is, in fact, a simple steelyard. The leverage distances between the knife edges are 3 5 and 1,750 millimetres, or in the ratio of 1 to 500. A graduated horizontal arm with sliding weight is mounted on a standard, and the extreme or free end of this is connected by knife edges to the rod supporting the weight pan previously mentioned. Loads up to 10,000 kilograms are weighed by the sliding weight. If the strength of the specimen exceeds this, the sliding weight is moved back, a 20-kilogram weight is placed on the weight pan, and subsequent loads up to the next 10,000 kilograms are weighed by the sliding weight as before. The sliding weight is operated by a screw, which is turned by a weight and clock-work. To the clock train is connected a dial by which loads of about 1 kilogram can be measured. The clock-work is automatically controlled by an arrangement which stops it whenever the graduated arm falls below the horizontal and starts it again when the arm is raised by the load.

The machine is intended primarily for testing wire rope, and two methods of securing the specimens in the grips are illustrated in the *Revue*. One method is to cast around the end of the specimen, for a length of about five diameters, an alloy of zinc or lead. The end thus prepared is held between four conical grips having their inner faces roughened. Another method is to separate the wires for a short distance at the ends of the specimen, double them back, insert a conical steel wedge centrally among them, and cast the end thus prepared in an alloy as before. This machine weighs about 18,700 lbs., was built by Bernhard Fernau & Co., of Ottakring, near Vienna, and costs, with all attachments, about $2,000.

### The St. Clair Tunnel.

Nihan, Elliott & Finn, the contractors for the tunnel approaches, last week surrendered the contract for the approach at the Sarnia side to confine their operations to the Port Huron approach, on which they will place their whole force. Thomas H. Murphy has taken charge for the company of the work on the Sarnia approach, and will use the steam shovels and other plant of the contractors. The working force has been increased to 250, and it is intended to increase it to the largest number that can be economically employed in the approach. It is thought that the proposed celebration at the opening of the tunnel will take place about June 15.

### New Machine Shops.

The Norfolk & Western will soon ask for bids for erecting a complete repair and building shop at Kenova, W. Va. The plans are almost completed and the ground has been purchased.

The Baltimore & Ohio has completed the purchase for $25,000 of 87 acres of ground at Cumberland, Md., making, with land already bought, 150 acres held by them at Cumberland. The ground is to be used for the erection of repair shops and to increase the yard capacity.

The Ohio River road will erect a roundhouse and shops on land of the Huntington & Kenova Land Improvement Co. at Central City, a new town recently laid out on the line of the proposed extension of the Ohio River road to Kenova.

### Annular Exhaust Nozzles.

The annular exhaust pipes, designed by Mr. John Player, Superintendent of Motive Power of the Santa Fé system, are reported to be giving very excellent results both as regards improvement in the steaming qualities of the engine to which they have been applied and reduction in back-pressure. By raising or lowering the central casting, the area of the final outlet, as well as the areas of the two exhaust pipes where they meet, are capable of adjustment without changing the ratios of the areas.

### The Pittsburgh and Lake Erie Ship Canal.

The most feasible route, according to a commission appointed by the Pennsylvania Legislature, for this canal is one starting from Conneaut, Ohio, a decayed Lake port, crossing the line between Ohio and Pennsylvania opposite Jamestown, Pa., and thence to Sharpsville, and thence down the valley of the Beaver to Rochester, on the Ohio River. The cost of the work is estimated at $25,000,000, and the time required for construction is put at four years. An alternate line is presented by the commission starting from Erie, Pa., passing by Conneautville and crossing the line into Ohio, and returning eastwardly to Shaw's Landing on the upper waters of the Allegheny River and following the valley to Franklin on the Allegheny, from which place the river will be utilized. As it can be claimed that this canal will materially extend the commerce of our great lakes, which is already of greater volume than the aggregate commerce of London and Liverpool, and as the course of the canal will be in two states, the Pennsylvania Legislature will, it is thought, ask the general government to take up the project. If the general government decides to build or assist in building this canal, the engineers should be authorized to contract for the whole work at once, as was done in the case of the new lock at the Soo, so that the fearful waste of money through the system of yearly appropriations may be avoided, which, in the case of the Tennessee River, as pointed out in the *Railroad Gazette* of Nov. 14, 1890, amounted to two-thirds of the cost for interest alone, neglecting depreciation of plant and other sources of loss inseparable from a dilatory conduct of work.

### Electric Light in Yards.

At the convention of the National Electric Light Association at Providence last Tuesday, Mr. W. H. Markland, of the Pennsylvania Railroad, read a paper on electric light as used on railroads. His principal topic was the illumination of freight yards and transfer stations. Railroad yards require an evenly diffused light rather than a bright light. On this account arc lamps should be hung 40 to 60 ft. above the ground and should be disposed with special reference to avoiding shadows and the obscuring of signals. Lights in switching yards are found to facilitate car inspection and all train movements, to prevent accidents to trainmen and materially to lessen pilferage. The electric headlight for locomotives will not, he thinks, come into general use. If any inventor wished to get up one he should confine himself to a lamp of 100 candle power. A dynamo and lamp for this purpose must be as simple as an air brake and no more liable to get out of order. Electric train-lighting is a luxury and costs ten times as much as gas. The arc light is used to an increasing extent in wrecking operations.

## THE SCRAP HEAP.

### Notes.

The Chicago & Eastern Illinois has put on a through vestibule train between Chicago and Nashville, Tenn., via the Louisville & Nashville.

A fire which started in the Pullman car shops at St. Louis, Feb. 6, did considerable damage to machinery, buildings and 11 cars which were in the shops at the time. The damage is estimated at $250,000.

The train dispatchers of the Grand Rapids & Indiana have been ordered to make trips over the road with sufficient frequency to keep themselves perfectly familiar with the physical characteristics of the lines of which they have charge.

The Canadian Pacific, after considerable negotiation with its trainmen, has established new rates of pay, which are in most cases from 5 to 10 per cent. higher than the old rates and which practically concede nearly all the demands of the men.

It is said that arrangements are about completed whereby Missouri Pacific trains will be run into Denver from Pueblo over the Fort Worth Division of the Union Pacific, the present contract with the Denver & Rio Grande not being renewed at its expiration.

An order has been issued on the Pittsburgh, Cincinnati, Chicago & St. Louis prescribing rules for the transportation of oil. When there is a sufficient number of oil cars to make up a train, it will be run exclusive of any other freight. When less than 15 cars, they shall be placed between the cars carrying low-class freight.

### Foreign Notes.

The French Minister of Public Works has issued a circular letter to the prominent railroads of France requesting them to make adequate provision for heating the third-class cars on their lines.

Certain Austro-Hungarian railroad trains are to be lighted by electricity. Tudor accumulators are to be used for the purpose, and the system is, for the present, to be confined to express trains. Should the results prove satisfactory, however, the electric light will be used on all the trains.

The Twin Cities Passenger and Ticket Association has been organized in St. Paul, Minn. It is composed of 74 passenger and ticket agents of St. Paul and Minneapolis, together with the traveling passenger agents having headquarters in those cities. The officers of the association are: President, C. E. Stone; Vice-President, F. G. Carrie; Secretary, C. E. Johnson; Treasurer, Charles Thompson. Committees were appointed to arrange for the reception and entertainment of the International Association, which meets in St. Paul and Minneapolis in August.

In view of the fact that a large number of passengers afflicted with pulmonary complaints are carried on French railroads on their way to southern districts, it has been found expedient to adopt measures to insure thorough disinfection of the bedding in the sleeping cars and of the seat cushions. The velvet cushions and silk curtains will be abandoned, and the seats will be fitted with soft leather coverings which can be easily cleaned. Coarse carpets are to be substituted for those of finer quality now in use, and these are to be thoroughly beaten after every trip. The bed clothes will be steamed, and the mattresses covered with impervious silk or with gutta-percha. Beside all this, it is considered desirable to provide isolated compartments for passengers suffering from pulmonary disease.

For some time past plans for improving the mail service between Sweden and Germany, or more particularly between Stockholm and Berlin, have been under consideration, and the projected railroad between Bergen and Sassnitz, with a harbor at the latter place, to be built by Prussia, is to mark the beginning of the undertaking. Of three proposed Swedish harbors, to be connected with the interior by railroads, Trelleborg has been chosen, since it offers the greatest freedom from ice, and the connecting road is to pass from Stockholm to Trelleborg by way of Lund. Trelleborg and Sassnitz are to be connected by a steamship line, and from Sassnitz trains will be run directly through to Berlin. There are to be trains every day throughout the year, and the time of transit from Stockholm to Berlin is placed at from 24 to 28 hours.

### Pullman Taxes in Iowa.

Judge Love, in the United States District Court at Des Moines, has issued an order continuing the injunction restraining the county treasurers of the state from collecting the taxes assessed against the Pullman Company on rolling stock used in Iowa. The stock was first assessed by the State Executive Council in the spring of 1888. A temporary injunction was immediately secured, but the case has been continued from year to year to await the decision of a similar case from another state now pending in the United States Supreme Court.

### Bridges Wrecked on the Tuckaseegee.

A "boom" at a saw-mill on the Tuckaseegee River, near Dillsboro, N. C., broke last week and 3,000 logs, released rushed downward to the Tennessee River, wrecking the wooden bridges of the Richmond & Danville on the Tuckaseegee.

### School for Railroad Construction in China.

The Vice-roi Li Hung Chang has decreed to establish, in Tientsin, a school for railroad construction in connection with the military school. Herr Baur, a representative of the firm of Krupp, is going to undertake the management of the institute. The first twenty scholars who entered belong to the military department.—*Kuhlow's.*

### The Strange Experience of an Editor.

We recently saw three switchers, standing in a yard, close together, but not all belonging to one company. All had driver brakes; one the old style, American, double-piston, spread, steam brake; the second had a vacuum brake, and the third had an American brake operated by air. The first device leaked so you could scarcely see the engine, the second had two shoes out of the six off and braking against the beam-heads, and each arm to the diaphragms was loaded down with broken draw-heads, links and shorn pieces of rail. The air-pump of the third was dancing along about 80 miles an hour, trying to supply air for a half-inch split in a pipe, the wounded pipe having been poulticed with a piece of old overall, and some wire, but the bandage had slipped.—*Locomotive Engineer.*

### The New Sault Ste. Marie Canal Lock.

The contract to build the new lock in the Sault Ste. Marie Canal has been awarded to Hughes Bros. & Banks, Syracuse, N. Y., their bid being $1,268,500. The lock is to be 800 ft. long and 100 ft. wide. At mean low water there will be a depth of 21 ft. in the lock. In the lock there will be over 80,000 cubic yards of masonry. Over 2,500,000 ft. of lumber will be required in its construction. The gates will weigh over 1,200 tons. It is hoped that the lock will be completed in five years.

### Manchester Ship Canal.

Messrs. N. M. Rothschild & Sons are offering at par £453,000 first mortgage 4 per cent. bonds of the Manchester Ship Canal Company, payable in 1914, which is the balance of an authorized total of £1,812,000. At a meeting lately held the Chairman of the company said that as the executors of the late contractor, Mr. Walker, declined to put on any more plant until certain claims had been paid, there was no option between a law suit and taking over the contract, which was done by the canal company from Nov. 24, last. It is now estimated that £1,700,000, over and above the authorized capital, will be required to finish the canal. It is proposed to open the canal by midsummer, 1892.

## LOCOMOTIVE BUILDING.

The Iowa Central has just received from the Pittsburgh Locomotive Works four 10-wheel freight engines. The cylinders are 18 × 24 in.; wheel centres, 48 in. diameter; tires, 3½ in. thick, and diameter of boiler at smallest ring, 56 in. These engines weigh in working order, 100,000 lbs., and will haul five more loaded cars than the 17 × 24 8-wheel engines hitherto in use.

The Long Island road let a contract last week for 10 locomotives, the Cooke Locomotive Works being awarded five ten-wheel freight and two ten-wheel passenger engines. The Schenectady Locomotive Works were awarded three switching engines.

The Central of New Jersey has let an order for three passenger engines to the Cooke Locomotive Works.

The Schenectady Locomotive Works are building 12 locomotives for the Chicago, St. Paul, Minneapolis & Omaha, which are to be delivered in March and April.

The Chicago & West Michigan and Detroit, Lansing & Northern have recently ordered two new locomotives.

The southwest system of the Pennsylvania lines is to build 29 engines this year to fill vacant numbers; four of these are to be of the class "O" pattern of heavy passenger engines, while the remaining 25 will be of the class "R" pattern of heavy freight engines.

The Chicago & Grand Trunk has received four new locomotives from the Rogers Locomotive Works in Paterson, N. J., the first of an order for 10 placed with that firm.

## CAR BUILDING.

The Chicago & Northwestern is preparing specifications for 50 passenger cars, for which contracts will soon be let.

The Chicago & West Michigan is about to place orders for about 12 new baggage, mail and combination cars.

The Huntingdon & Broad Top Mountain road placed an order for 200 coal cars of 60,000 lbs. capacity this week with a Pennsylvania firm.

The Rome, Watertown & Ogdensburg has contracted with the Michigan Car Company, of Detroit, for the construction of 1,000 box cars, 250 platform cars and 150 gondolas.

The 100 furniture cars now being built by the Haskell & Barker Car Co., of Michigan City, Ind., for the Great Northern, are some of the largest ever built, being 39 ft. 6 in. long, 8 ft. 6 in. wide and 8 ft. 2 in. high, making a total capacity of 2,700 cu. ft.

The Manistee & Northeastern will soon order 100 platform cars.

The first of five new sleeping cars, built by the Ohio Falls Car Co. of Jeffersonville, Ind., has been received by the Central of Georgia.

The Ensign Car Mfg. Co., Huntington, W. Va., has delivered nearly one-half of the 1,000 freight cars ordered by the Mexican International.

A frost-proof car of the Kimball patent has been built by J. Harris & Co., at St. John, N. B., for the Canadian Pacific. The car is very similar to those built under this patent last winter, but it has several improvements.

The New York, New Haven & Hartford and the New York & New England are soon to put a new line of cars on their New York and Boston route (3 p. m. train each way daily) to be operated jointly. The outside of all the cars is to be painted white, and the ornamentation will be in gold. There are 13 cars ordered to be painted in this style, and all have been delivered except four parlor cars. The order includes 7 parlor cars, 60 ft. long, four combination and two baggage cars. The New Haven road will own four of the parlor cars and half of the other cars. All the cars have been built at the Pullman Works. They conform to the standard patterns of the roads in all essential particulars, and no attempt has been made to devise anything new in the interior arrangement. The white outside color is the only novelty about the cars, and from the comment already evoked, it would seem as if the wily passenger agents had secured an eminent degree of success in a bold bid for novelty, as passenger agents can hardly expect to devise many more "conveniences" in the furnishing of the cars, and the most promising field for their genius would seem to be in developing "Royal Blue," "Imperial Green," etc.

## BRIDGE BUILDING.

**Anacortes, Wash.**—The Seattle & Northern will soon call for bids for the construction of a new iron drawbridge on that line, to replace the timber bridge over Swinomish slough. The iron drawbridge will be 310 ft. over all, giving 150 ft. in the clear, and will cost about $35,000.

**Atlanta, Ga.**—The City Council of Atlanta has appropriated $25,000 for the construction of a bridge across the railroad tracks on Forsythe street.

**Bellevernon, Pa.**—A company composed of Dr. J. S. Van Vorhiss, Isaac S. Van Vorhiss, J. C. Cuningham, S. F. Jones, J. S. Jones, R. J. Linton, Thomas L. Daily, Thomas P. Grant, G. S. Speers, Chas. P. Speers, A. L. Brown and W. J. Manown, has been formed with a paid up capital of $200,000, for the purpose of building a highway toll bridge over the Monongahela River at Bellevernon.

**Bristol, Me.**—A bill has been prepared to authorize this town to construct a bridge over tide water at Rutherford's Island Gut.

**Brookline, Mass.**—Proposals will be received until Feb. 23 for building the superstructure of a plate girder bridge over the tracks of the Boston & Albany railroad at Dean Road. The span of the bridge will be 60 ft., the width 50 ft. and the weight of iron about 75,000 lbs. Plans and specifications can be obtained of Alexis H. French, Brookline. Bids should be addressed to A. L. Lincoln, Chairman of the selectmen.

**Buffalo Creek.**—There has been filed with the County Clerk at Buffalo, N. Y., a mortgage for $1,000,000 given by the company to the E. B. Wilbur Trust Co. The bonds are to take up those given in 1882 for $250,000, bearing a higher rate of interest, and to secure money with which to extend the road.

**Canton, O.**—The Canton Bridge Co., of Canton, has been incorporated for the manufacture of iron, wooden, or combination bridges. The incorporators are C. H. Barnard, G. L. Miller and J. R. Herring.

**Charleston, W. Va.**—The new bridge over the Kanawha River was completed last week by the Keystone Bridge Co., of Pittsburgh, Pa. This is the bridge from which the channel span false work was washed away a few weeks ago. The false work was washed out again within 24 hours after the span was made self-supporting.

**Davenport, Ia.**—The Board of Supervisors has determined to erect several new bridges during the present year. The first two built will be over Duck Creek and Spencer Creek, and plans for them will probably be made soon.

**Grafton, W. Va.**—The new steel bridge of the Baltimore & Ohio over the Tygarts Valley River at Grafton, built to take the place of the old wooden structure, a part of which was knocked down by a derailed train a few months ago, is almost completed. The new bridge is of steel-plate girders on the east side and the overgrade plan at the west. The structure cost about $100,000.

**Great Northern.**—This line is reported to have let a contract to Porter Brothers, of Duluth, Minn., to do all the bridge building on the extension between the summit of the Rocky Mountains and the Pacific coast.

**Los Angeles, Cal.**—The Southern Pacific has submitted plans to the city engineer of Los Angeles for two large bridges. The largest one, to cross the Los Angeles River, north of the Santa Fe's bridge, is to be a double-track steel "skew" bridge of two spans of 156.1 ft. each. The other bridge will be similar, but single track. It will also consist of but two spans, of 166.8 ft., and will be built at the end of Mission street, on the Yuma division of the road. The structures will rest on iron cylinders 7 ft. in diameter, that will be sunk 50 ft below the bottom of the river, and then filled with concrete. The bridges will cost nearly $100,000.

**Lynchburg, Va.**—The contract has been let for the construction of an iron bridge across Blackwater Creek.

**Newburgh, W. Va.**—The town council has awarded a contract to the Wrought Iron Bridge Co. of Canton, O., for a highway bridge over Raccoon River at that place, to be completed May 1.

**Vale, Or.**—A bill has been introduced in the state legislature to appropriate $10,000 for constructing a bridge across the Owyhee River near Vale.

**Wallaceburg, Ont.**—T. B. Gillard, Warden of this town, is calling for tenders, to be received up to March 2, for constructing a new stone and iron bridge across the north branch of the River Sydenham, in Wallaceburg. Tenders may be for the whole work, or substructure and superstructure separately. All the work is to be completed by June 15. Plans and specifications may be seen at the office of Messrs. Gillard & Riddell, Wallaceburg.

## RAILROAD LAW—NOTES OF DECISIONS.

### Powers, Liabilities and Regulation of Railroads.

In Arkansas the Supreme Court holds that a bridge built by a corporation organized for that purpose is not the property of a railroad company, and assessable for taxes as such by the state, though the stockholders of both companies are the same, and all of the bridge company stock is pledged to the railroad company, which by contract has the permanent use of the bridge.[1]

A statute making it criminal to displace, remove or destroy a "rail, sleeper, switch, bridge, viaduct, culvert, embankment or structure appertaining to or connected with a railway," it is held by the Supreme Court of Minnesota is not applicable to the cutting of a fence along a railroad track by defendant to facilitate the driving of stock from one part of his farm to another.[2]

In Illinois the Supreme Court holds that where a railroad removes a station from a village of less than 200 inhabitants to a point half a mile distant, which is more accessible to the neighboring farmers, who constitute a large majority of the persons who use the road, and it appears that stations cannot be profitably maintained at both points, *mandamus* will not lie to compel the company to maintain a station at such village.[3]

In Minnesota it is ruled that in assessing damages to a railroad for laying out a highway across its track, benefits by increase in its traffic or business, arising from the increased facility for travel which the highway affords, are not to be taken into account. Nor is the railroad entitled to compensation for providing and maintaining cattle-guards and sign-boards at the new crossing.[4]

In the same state it is held that the statutes which require railroads to construct crossings wherever highways intersect their tracks are not unconstitutional because they make no provision for compensation, since such provision is made by the general statutes regulating the laying out of highways.[5]

In Georgia the Supreme Court rules that where a charter granting the privilege of choosing its own route between two points, is amended by the insertion of a proviso that under certain conditions the road shall pass through an intermediate point, such proviso is not void as being repugnant to the purview of the charter.[6]

In Indiana the Supreme Court rules that the grant of a right of way to a railroad, being merely the convey ance of an easement, does not affect the right of the grantor to the use of a stream of water flowing over the land.[7]

In Montana it is held by the Supreme Court that a railroad cannot grant to one hack-owner the exclusive right to use its platform for receiving and discharging passengers.[8]

In the Supreme Court of the United States it is decided that a tax assessed against a railroad company which is a link in a through line of road, and carries freight and passengers in and out of the state, by the state through which the true line passes, as a condition precedent to its keeping an office in such state for the use of its officers, agents, and employés, is a tax on the means by which the company is enabled to carry on its business of interstate commerce, and is, therefore, in violation of the constitutional provision giving the power to regulate interstate commerce to congress.[9]

In New Jersey it is laid down that a dedication of land for public use as a highway may be made subject to a right to devote a part thereof to use for railroad purposes, and when such portion has been thus devoted, the use as a way will be suspended, and remain suspended so long as that part is used for railroad purposes.

### Injuries to Passengers, Employes and Strangers.

In Maryland the plaintiff's station was called, and the train stopped. The train had not yet reached the depot; but plaintiff, supposing it had, got off hurriedly as the train started again. Passengers had been accustomed to alighting at the place where he got off; and a special rule of defendant, requiring trains approaching a station to stop in case another train should be discharging passengers there, was known to plaintiff. The Court of Appeals holds that it was not contributory negligence, as a matter of law, because he did not look out, before alighting, for the train which struck him, although he could have seen it if he had.[11]

In New York there were no vacant seats on the train when plaintiff boarded it, and she was told by the conductor that another coach would be attached, which was shortly backed up; but, the draw-heads failing to catch, the coupling was not made and the cars separated several feet. As the cars came together one of plaintiff's party passed over and called to her to come on. Just then she heard the conductor cry, "All aboard," and, hurrying forward, she fell through the open space and was injured. It was about dusk, and there were other passengers on the platform in front of plaintiff, who obstructed her view. The Court of Appeals holds the railroad liable.[12]

In Louisiana it is held that a railroad is liable for damages for the death of an employé in a wreck caused by rotten cross-ties and unsafe condition of its road-bed. But it is not liable in punitive or exemplary damages for its negligence in causing the death of an employé, unless malice or oppression forms part of the act resulting in such death.[13]

In Georgia it is ruled by the Supreme Court that the fact that there was only one brakeman on a train of ten loaded cars, and that only one brake was applied while it was being let down a steep grade to make the coupling, in doing which plaintiff was injured, was sufficient evidence to go to the jury on the question of defendant's negligence.[14]

In New York the Supreme Court holds, that a conductor who, in the day-time, and in a freight-yard with which he was thoroughly familiar, steps from his moving train, and walks along a parallel track without looking behind him, and is injured by an engine coming from that direction, is guilty of contributory negligence, though he was engaged in watching a brakeman throw a switch to conduct the train upon a siding.[15]

In Louisiana it is held by the Supreme Court that, where a conductor on discovering that a car had been broken open, believing that it had been done by a certain person, walks up to such a person, as he is standing quietly at a station, saying and doing nothing, and shoots him down without a word, such act constitutes murder, entirely beyond the scope of any employment or function of the conductor, for which the company could not be held responsible.[16]

In Ohio the Supreme Court rules that a railroad is liable for injuries to a child resulting from the explosion of a torpedo which he found on the track, though it was placed there by the company's servants wantonly and in violation of its rules; for the servant's employment includes the safe custody as well as the proper use of such inherently dangerous instruments, and the master is liable for his negligence in one branch of his duty as well as in the other.[17]

In Texas it is decided that the fact that railroad employés, while using a hand-car for their private business contrary to the rules of the company, allow a young child to ride on the car, whereby he is injured, does not make the company liable.[18]

In New York it is held by the Supreme Court that the falling from an elevated railroad structure of a crow-bar which was in use by an employé repairing the track, whereby a person in the street below was injured, raises a presumption of negligence, which is not overcome by proof that the crow-bar was dropped through the employé's efforts to save himself from falling.[19]

In Texas the rather obvious ruling is made that for a person to go to sleep on a railroad track is contributory negligence.[20]

[1] St. Louis & S. F. R. Co. v. Williams, 13 S. Rep., 796.
[2] State v. Walsh, 45 N. W. Rep., 721.
[3] Mobile & Ohio R. Co. v. People, 24 N. E. Rep., 642.
[4] State v. Shardlow, 46 N. W. Rep. 74.
[5] State v. Shardlow, 46 N. W. Rep., 74.
[6] Macon & B. R. Co. v. Stamps, 11 S. E. Rep., 442.
[7] Smith v. Holloway, 24 N. E. Rep., 886.
[8] Mon. Union R. Co. v. Langlois, 21 Pac. Rep., 209.
[9] N. & W. R. Co. v. Com., 10 S. C. Rep., 958.
[10] Ayres v. Pennsylvania R. Co., 20 Atl. Rep., 54.
[11] Philadelphia, W. & B. R. Co. v. Anderson, 20 Alt. Rep., 2.
[12] Lent v. N. Y. C. & H. R. R. Co., 24 N. E. Rep., 653.
[13] McFee v. Vicksburg, S. & P. R. Co., 7 South. Rep., 720.
[14] Georgia Pac. Ry. v. Propst, 7 South. Rep., 635.
[15] Redmond v. Rome, W. & O. R. Co., 10 N. Y. (Supp.), 330.
[16] Candiff v. Louisville, N. O. & T. Ry. Co., 7 South. Rep., 601.
[17] Pittsburgh, C. & St. L. Ry. Co. v. Shields, 24 N. E. Rep., 658.
[18] Dawkins vs. Gulf, C. & S. F. Ry. Co., 13 S. W. Rep., 984.
[19] Morsemann v. Manhattan Ry. Co., 10 N. Y. (Supp.), 105.
[20] Houston & T. R. Co. v. Smith, 13 S. W. Rep., 972.

## MEETINGS AND ANNOUNCEMENTS.

### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Boston & Maine*, $3 per share on the preferred stock, payable March 2.

*Chicago, Burlington & Quincy*, quarterly, $1 per share, payable March 16.

*Chicago & West Michigan*, 2 per cent., payable Feb. 16.

*Cleveland & Pittsburgh*, quarterly, 1¾ per cent., payable March 1.

*Kansas City, Fort Scott & Memphis*, 4 per cent. on the preferred and 1 per cent. on the common stock, payable Feb. 16.

*North Carolina*, annual, 6 per cent., 3 per cent. payable March 1 and 3 per cent. payable Sept. 1.

*North Pennsylvania*, quarterly, 2 per cent., payable Feb. 25.

*York, Harbor & Beach*, $1 per share, payable Feb. 10.

### Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Atlanta & Charlotte Air Line*, annual, 48 Wall street, New York City, March 11.

*Bedford & Bloomfield*, annual, 47 Broadway, New York City, March 11.

*Camden & Atlantic*, annual, cor. Delaware and Federal streets, Camden, N. J., Feb. 26.

*Charleston & Savannah*, annual, Charleston, S. C., March 2.

*Chicago Belt*, special, Chicago, Ill., Feb. 24, for the purpose of making a new lease with the Chicago & Western Indiana.

*Chicago & Western Indiana*, special, Chicago, Ill., Feb. 24, to consider proposed improvements.

*Cincinnati & Muskingum Valley*, annual, Zanesville, O., March 24.

*Cleveland & Canton*, special, Canton, O., Feb. 25.

*Danville & Seaboard*, annual, Atlantic Hotel, Norfolk, Va., March 2.

*Delaware, Lackawanna & Western*, annual, 26 Exchange Place, New York City, Feb. 24.

*Detroit, Charlevoix & Escanaba*, annual, Charlevoix, Mich., March 4.

*Florida Central & Peninsula*, annual, Jacksonville, Fla., March 5.

*Grand Rapids & Indiana*, annual, Grand Rapids, Mich., March 4.

*Gulf, Colorado & Santa Fe*, annual, Galveston, Tex., March 3.

*Illinois Central*, annual, Chicago, Ill., March 11.

*Kansas City, Clinton & Springfield*, annual, Kansas City, Mo., March 11.

*Kansas City, Fort Scott & Memphis*, annual, Kansas City, Mo., March 11.

*Kansas City, St. Louis & Chicago*, annual, St. Louis, Mo., March 10.

*Louisville, New Albany & Chicago*, annual, 47 Broadway, New York City, March 11.

*Missouri Pacific*, annual, St. Louis, Mo., March 10.

*New York & New England*, annual, Boston, Mass., March 10.

*New York, Susquehanna & Western*, annual, Taylor's Hotel, Jersey City, N. J., Feb. 26.

*Norfolk Southern*, annual, Elizabeth City, N. C., March 5.

*Norfolk & Virginia Beach*, special, Norfolk, Va., March 2.

*Northern Central*, annual, Baltimore, Md., Feb. 26.

*Pennsylvania*, annual, Philadelphia, Pa., March 10.

*Peoria, Decatur & Evansville*, annual, Peoria, Ill., March 3.

*St. Louis, Iron Mountain & Southern*, annual, St. Louis, Mo., March 10.

*Savannah, Florida & Western*, annual, Savannah, Ga., March 4.

*West Jersey*, annual, cor. Delaware and Federal streets Camden, N. J., March 3.

*West Jersey & Atlantic*, annual, cor. Delaware and Federal streets, Camden, N. J., March 3.

### Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1 122 Girard street, Philadelphia, on the first and third Saturday, of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8:00 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

### American Association of General Passenger and Ticket Agents.

The semi-annual meeting was held in Chicago, Feb. 17. E. O. McCormack, of the Cincinnati, Hamilton & Dayton, was elected President; A. S. Hanson, of the Boston & Albany, Vice-President, and A. J. Smith, of the Lake Shore & Michigan Southern, Secretary. The most important subject considered was the abolishment of unlimited tickets. A committee was appointed to represent all American roads not in association in a conference with the existing associations looking to that end. It was decided that prepaid ticket orders should be handled the same as coupon tickets, and the plan by which every road is to be represented by a number, and these numbers be stamped on coupon tickets, was approved. The fall meeting will be held at Old Point Comfort on the second Tuesday in September.

**American Institute of Electrical Engineers.**

The fifty-fourth meeting will be held on Tuesday evening, Feb. 24, at 8 o'clock, at the rooms of the Institute, No. 12 West 31st street, New York. A paper will be read by Mr. Oscar T. Crosby, of Boston, entitled: "Data and Results of Experiments with Electric Traction at 120 Miles an Hour."

A working model of an electric railroad made by Thomas Davenport in 1837 will also be exhibited in actual operation, and some interesting facts regarding its history will be given by Mr. Franklin Leonard Pope. If time permits, the reports of the Standard Wiring Table Committee and that of the Committee on Amendment of the Patent Law will be taken up for consideration.

**Canadian Society of Civil Engineers.**

The providing of an artificial waterway that would enable vessels, weighing with their cargoes 5,000 net tons, and having a draft of 20 ft., to trade between Liverpool and the great lakes, formed the subject of a paper by Mr. E. L. Corthell, read last week before the Canadian Society of Civil Engineers Mr. Corthell spoke of the modifications necessary to adapt the existing waterway to the ends explained in his paper, and also the different methods which could be used to shorten the distance by means of canals or ship railroads, in which he is a profound believer. The two principal ship railroads that he discussed was one leading from Benton Harbor, in Lake Michigan, to Monroe, on Lake Erie, a distance of about 160 miles, and the Hurontario ship railroad between Georgian Bay and Lake Ontario, a distance of 66 miles and costing about $12,000,000. By the aid of the Michigan, Peninsula and Hurontario ship railroads and the deepened canal system, Mr. Corthell estimated the cost of transportation per ton between Chicago and Liverpool at $3.36, or $2.50 less than by an all-rail route, or less than one-half the cost of all-rail transportation to New York and then by steamship to Liverpool. He contended that the advantage to the people of the district would be $200,000,000 per annum. The paper will be discussed at a meeting of the society to be held Feb. 26.

**Civil Engineers' Club of Cleveland.**

A regular meeting was held Feb. 10, at 8 o'clock, Vice-President Gobeille in the chair and 17 members and two visitors present. Prof. Frank H. Neff was elected to active membership.

It was voted that the chair appoint a committee of seven to make arrangements for the annual banquet, and that the time be as near March 17 as convenient.

Mr. H. W. Kingsley, Assistant Engineer of the city water works, read an interesting paper on "Notes and Surveys on the Cleveland Water Works Tunnels." He exhibited a large map showing the original location of the tunnel, and the final location as built. The original location was in a straight line from the shore shaft to the crib in the lake, but, on account of striking quicksand, detours were made, thus complicating the location. On account of the unequal settling of the crib, throwing the shaft out of plumb, the direction of the tunnel at that end was obtained from two plumb lines only 6 ft. 4 in. apart, yet the intersection of the centres of the two headings was only 6 in. north of the calculated point of intersection, showing the crib end of the tunnel only $\frac{9}{10}$ of an inch east of its calculated position. The measured length of the tunnel was $\frac{25}{1000}$ of a foot shorter than the calculated length in a distance of over 7,100 ft.

After the completion of the tunnel test levels were run, connecting the bench marks of the shore end with the lake end, and they were found to differ by only $\frac{16}{1000}$ of a foot. The map also showed the location and soundings for the proposed extension of the tunnel two and a half miles further into Lake Erie. Specimens of of wood, bark and nuts were shown that were found at depths of 60 to 80 ft. below the surface.

**Cleveland Superintendents' Association.**

This association has just been organized with C. J. Stedwell, of the Cleveland, Cincinnati, Chicago, & St. Louis, as President, and A. J. Johnston, of the New York, Chicago & St. Louis, as Secretary and Treasurer. It has 11 active members and 20 honorary members, the latter including the general superintendents and their assistants and also past superintendents of roads entering Cleveland. The association will meet on the second Tuesday of each month.

**Engineers' Club of Philadelphia.**

A regular meeting was held Feb. 7, Past President Rudolph Hering in the chair, and 18 members present.

Mr. Chas. H. Haupt presented an illustrated paper on Photographic Surveying, of which the following is an abstract. The location of points horizontally and vertically from photographs depends, in the first place, on the determination of the position of the point of sight for any view which is at a constant distance equal to the equivalent focus of the lens, and directly opposite the centre of the picture. The horizontal projections of points may now be connected with this point of sight, and horizontal angles thus determined. Vertical angles for heights are determined from their tangents. Triangulation of any point in the field may thus be effected; as it is possible to measure the true angle between this point and some other fixed point from two views taken from different stations. A photographic map of the Schuylkill River and Fairmount Park was shown. The map was made from photos taken from each side of the river. A panoramic view of the horizon was taken from each station, each view being oriented from the compass bearing of its centre. The base line was on the west bank and was 947 ft. long. A check station was taken on the west bank. The scale used was 200 ft. to 1 in., and points platted to this scale from the three principal stations checked exactly. Heights also checked up satisfactorily. The field work took but eight hours; platting, about three days. There was considerable discussion of this paper.

The Secretary presented for Mr. J. M. Stewart a paper by Mr. J. Bernard Walker, upon a Boltless Rail Joint. Mr. Stewart, who is Chief Engineer of the Oregon Pacific, is about to try it on that road.

**New England Railroad Club.**

The regular monthly meeting was held Feb. 11, President Richards in the chair. The subject discussed was "Painting and Varnishing of Railroad Rolling Stock." A report will be found in another column. The annual meeting of the club will be held on the evening of the second Wednesday in March, when reports of officers will be presented and officers for the ensuing year elected. The subject for discussion is "Screw Stay Bolts for Locomotives."

**Southern Railway Club.**

The Southern and Southwestern Railway Club met at the Reid Hotel, in Chattanooga, Tenn., at 10 a. m., Thursday, Feb. 19. The subjects for discussion were as follows: (1) "Brake Beams Suspended from the Car Body vs. Those Hung to the Truck." This subject is continued from last meeting and was to be opened by Mr. J. J. Casey Superintendent of Motive Power of the Louisville, New Orleans & Texas. (2) "Exhaust Pipes and Nozzles," opened by Mr. L. C. Noble, formerly Master Mechanic of the Houston & Texas Central. (3) "Breaking of Side Rods," which was expected to be opened by Mr. M. T. Carson, Superintendent of Motive Power of the Mobile & Ohio.

## PERSONAL.

—Mr. Philip Hoffecker, Master Mechanic and Superintendent of the Lehigh Valley shops at Weatherly, Pa., died at that town last Thursday.

—Mr. Rollin H. Wilbur, Jr., Assistant to the Second Vice President of the Lehigh Valley and a son of President Wilbur, has been appointed to a position on the staff of the Governor of Pennsylvania with the rank of Colonel

—Mr. T. J. Urquhart, Superintendent of the Visalia Division of the Southern Pacific, died Feb. 11 at Bakersfield, Cal., of typhoid fever. He had been in the service of the Southern Pacific Company for about 20 years, and had only recently been transferred from the Los Angeles and Ventura division.

—The resignation of Mr. Eckstein Norton as President of the Louisville & Nashville was announced last week. It is to take effect April 15 next. Mr. Norton gives as a reason for wishing to retire his desire to give more attention to his personal affairs.

## ELECTIONS AND APPOINTMENTS.

*Allegheny Valley.*—Edwin P. Bates has been appointed General Freight Agent, in place of Charles S. McCargo, deceased.

*Altoona & Wopsononock.*—At the recent annual meeting of the company, F. G. Patterson, Altoona, Pa., was re-elected President; W. L. Shellenberger, Vice-President, and Directors, W. L. Shellenberger, John Loudon, John A. Canan, William Loudon, George S. Adams, M. Scott, Gwin G. T. Bell, C. A. Wood, A. C. Shand, W. S. Lee, W. J. Heinsling, Andrew Kipple, J. C. Wittenberg and W. W. Low.

*Atchison, Topeka & Santa Fe.*—W. G. Nixon, Division Superintendent at Chillicothe, Kan., has been promoted to the position of Superintendent of Terminals at Chicago. He was formerly Superintendent of Terminals at Kansas City.

*Baltimore & Ohio.*—W. A. Pratt, of the Philadelphia division, has been appointed Engineer of Maintenance of Way of the Pittsburgh division, vice F. W. Patterson, resigned. J. F. Legge has been appointed General Agent, with headquarters at Wheeling, W. Va., and Superintendent of Wheeling terminals. He will have general charge of the company's passenger and freight business at Wheeling.

*Baltimore & Ohio Southwestern.*—The adjourned annual meeting of the stockholders was held in Cincinnati yesterday. The following were elected directors: E. Bacon and H. W. Poor, New York; W. P. Harvey, Baltimore; Orland Smith, W. W. Peabody, Lowe Emerson and F. H. Alms, Cincinnati; Amos Smith and W. T. McClintock, Chillicothe; Patrick Buchan and George H. Hopkinson, London. The new directors organized by the election of the following officers: E. R. Bacon, President; W. W. Peabody, Vice-President.

*Bangor & Aroostook.*—The following are the incorporators of this new Maine road: Albert A. Burleigh, Houlton, Me.; Hiram H. Fogg, Frederick H. Appleton and Charles F. Bragg, Bangor, Me.

*Bedford & Bridgeport.*—The company's annual election was held in Philadelphia this week in the offices of the Pennsylvania, at which the following officers were elected: President, R. D. Barclay; Directors, J. J. Barclay, J. N. Du Barry, John P. Green, William M. Hall, John G. Harrley, H. H. Houston, Wistar Morris, William A. Patton, G. B. Roberts, S. L. Russell, N. Parker Shortridge and Henry D. Welsh.

*Cleveland, Cincinnati, Chicago & St. Louis.*—The position as Mechanical Engineer has been re-established and G. J. Worthington has been appointed Mechanical Engineer.

*Colorado & Northeastern.*—At a meeting of the directors in Pueblo, Colo., Feb. 12, the following officers were elected: O. H. P. Baxter, President; E. M. Steck, Vice-President; W. L. Graham, Treasurer; H. J. Fitch, Secretary; H. R. Holbrooke, Chief Engineer. The principal office of the company is to be in Pueblo.

*Delaware & Bound Brook.*—John S. Wise has been elected Secretary and Treasurer of the Delaware & Bound Brook and East Trenton companies.

*Duluth, Mesabi & Northern.*—The incorporators of the company are: K. D. Chase, Faribault, Minn., President; Leonidas Merritt, West Duluth, Vice-President; S. R. Payne, Duluth, Secretary; C. C. Merritt, West Duluth, Treasurer; Roswell H. Palmer, of Duluth; A. R. Merritt, Alfred Merritt, and N. B. Merritt, of West Duluth.

*Dunkirk, Allegheny Valley & Pittsburgh.*—W. G. Taber has been appointed Master Mechanic, to succeed J. C. Haggett, resigned.

*Florida Central & Peninsular.*—M. J. Rogers, late of the Atchison, Topeka & Santa Fé, has been appointed Superintendent of Machinery. He takes charge of shops, locomotives, cars and all other equipment, and matters pertaining thereto.

*Fort Gibson, Tahlequah & Great Northeastern.*—The following are the officers of this company: J. E. Crane, President, Siloam Springs, Ark.; W. W. Brown, Vice-President, Siloam Springs, and E. T. Smith, Secretary, Siloam Springs; W. R. Felker, Treasurer, Rogers, Ark., and E. P. Watson, General Manager, Bentonville, Ark.

*Fort Wayne, Jackson & Saginaw.*—The company has elected the following directors: Samuel Sloan, R. G. Rolston, L. Turnure, W. D. Searls, P. R. Pyne, S. S. Palmer, Henry Biste, William S. Sloan, New York; Amos Root, Dwight Merriman, Jackson, Mich., and Jas. F. Joy, Detroit, Mich.

*Georgia.*—The annual meeting was held in Augusta, Ga., last week, and the following officers and directors were elected: President, Hamilton Wilkins; Vice-President, J. W. Inman; Directors, G. W. Stetson, J. H. Alexander, Wm. T. Gary, W. B. Young, C. H. Howard, H. H. Hickman, L. D. Matthews, J. Stapleton, Macon Wartchen, J. T. Neal, Hamilton Wilkins, J. W. Inman. The directors re-elected Capt. George Adam Secretary and Treasurer. Maj. Wilkins succeeds Col. Mitchell as President. He will continue to act as General Manager.

*Guala'a River.*—Incorporated in California by William B. Haywood, Franklin Haywood, S. H. Harmon, Charles L. Dingley, Jr., and H. A. Powell.

*Guelph Junction.*—The annual meeting of the stockholders was held last week, and the following directors were elected: William Bell, John M. Bond, Thomas Gowdy, Charles Raymond, and George Sleeman. W. Bell was elected President, and A. H. Macdonald, Secretary and Treasurer

*Kentucky Central.*—Brent Arnold has been appointed General Freight Agent, with office at Cincinnati, O., vice C. L. Brown, resigned.

*Kinzua Valley.*—The company has elected the following officers for the ensuing year: President, S. S. Bullis, Olean, N. Y.; Vice-President, John Burns, New York; Secretary, H. L. Hastings, Bradford, Pa.; Treasurer, F. E. Brooks, Bradford; General Manager, J. C. French, Olean; Superintendent, J. R. Rooney, Olean; Directors, S. S. Bullis, J. C. French, G. L. Roberts, John Burns, F. E. Brooks, H. L. Hastings and J. R. Rooney. The same officers have been elected by the Hamilton & Corydon.

*Little Falls & Dolgeville.*—Warren H. Loss, 18 Broadway, New York City, has been elected President of this road; Alfred Dolge, Dolgeville, N. Y., and Titus Sheard, Little Falls, N. Y., have been elected Vice-Presidents. E. T. Watells, 52 Broadway, is Secretary.

*Maryland Central.*—The resignation of F. P. Hubbell as General Freight and Passenger Agent having been accepted, the traffic department will be in charge of C. F. Kerchner, Superintendent, temporarily.

*Meadville & Linesville.*—A. C. Huidekoper, Meadville, Pa., has been appointed Receiver, and T. J. Blair, General Manager of the Pittsburgh, Shenango & Lake Erie, has been appointed General Manager.

*Mifflin & Centre County.*—The following officers were elected by the company this week: President, J. N. Du Barry; Directors, R. D. Barclay, W. H. Barnes, G. W. Elder, John P. Green, R. H. Lee, James H. Mann, Wistar Morris, William A. Patton, G. B. Roberts, N. Parker Shortridge, Henry D. Welsh and W. H. Wilson.

*New York, Texas & Mexican.*—The annual meeting of the road for the election of officers was held in Victoria, Tex., this week. The officers elected are: J. Kruttschnitt, President; M. D. Monserratte, Vice-President; W. J. Craig, Treasurer, and C. S. Wells, Secretary.

*Niagara Shore Terminal.*—The stockholders of the road have perfected their organization by electing F. C. M. Lautz, of Buffalo, N. Y., President and Treasurer, and B. H. Long, Vice-President and Secretary.

*Peterborough, Sudbury & Sault Ste. Marie.*—The officers of this Canada company are: John Burnham, President; Thomas Cahill, Vice-President, and E. H. D. Hall, Secretary, all of Peterborough, Ont.

*Shepaug, Litchfield & Northern.*—At a meeting of the directors of the road, held at Litchfield, Conn., Feb. 13, the following officers were elected: President, J. L. MacAuley, New York; Vice-President, W. H. Stevenson, Bridgeport, Conn.; Secretary, E. N. Carey, New York; Treasurer, C. H. Cort, Litchfield; Superintendent, Alexander McNeal, Litchfield, Conn. The road is now under the control of the Housatonic system.

*Southwestern (Ga.)*—The annual meeting of the stockholders of the road, held in Macon last week, resulted in the re-election of the directors as follows: J. E. Jones, President; W. J. Brantly, Secretary; directors, Virgil Powers, John S. Baxter, W. G. Raoul, John J. Gresham, L. A. Jordan, H. M. Comer and E. P. Alexander.

*Southern Pacific.*—J. H. Whited, of the Truckee Division, has been appointed General Manager of the Visala Division to succeed the late T. J. Urquhart. James Agler, trainmaster, has been appointed Superintendent of the Truckee Division, and D. Berkhalter Superintendent of the Los Angeles and Ventura Division.

*Tintic Valley.*—The directors of the proposed company have completed the organization, and these officers have been elected: President George Arthur Rice; Vice-Presidents, A. E. Hyde, W. W. Chisholm; Secretary, J. A. Cunningham, all of Salt Lake City, and Treasurer, L. L. Bailey, Ouray, Col.

*Toledo, Ann Arbor & North Michigan.*—W. F. Bradley has been appointed Master Mechanic of the road to succeed A. Galloway, who resigned a few weeks ago to accept a similar position in the employ of the Cincinnati, Hamilton & Dayton.

*Union Pacific.*—An order has been issued reorganizing the freight department. J. A. Monroe, present Assistant Traffic Manager, becomes General Freight Agent, relieving F. B. Whitney, and will have general supervision of the entire system. B. Campbell, at present General Freight Agent of the Pacific division, will be General Western Freight Agent, with headquarters at Portland. F. B. Whitney, present General Freight Agent, becomes First Assistant. Assistant General Freight Agents are appointed at Denver, Salt Lake, Portland, St. Joseph, Kansas City, and Butte. This change goes into effect March 1.

*Waynesbury & Washington.*—The annual meeting of the road was held in Pittsburgh last week, and the stockholders elected the following officers: President, George B. Roberts, Philadelphia; Vice-President, Thomas D. Messler, Pittsburgh; Treasurer, John E. Davidson, Pittsburgh; Secretary, S. B. Liggett, Pittsburgh, and John W. Renner, of Pittsburgh, Auditor.

*Western & Atlantic.*—Major J. L. McCollum, formerly General Agent of the Nashville, Chattanooga & St. Louis, at Chattanooga, has been appointed Superintendent of the Western & Atlantic to succeed Robert A. Anderson, resigned.

Hunter McDonald has been appointed Chief Engineer to succeed the late Eben Pardon. Mr. McDonald has been connected with the Nashville, Chattanooga & St. Louis as Engineer.

*Wilcox & Rocky Run.*—The incorporators are Irving Schultz, Wilcox, Pa., President; A. A. Clearwater, C. W. Speltigue and P. S. Emhart, Wilcox, Pa.; Norman Schultz, Summit, N. J.; C. H. McCauley and Jno. G. Whitmore, Ridgway, Pa.

*Wilmington Sea Coast.*—The following Board of Directors was elected at the recent annual meeting: E. S. Lattimer, B. G. Worth, G. H. Smith, George R. French,

H. M. Bowden, James H. Chadbourn, Jr., and William H. Chadbourn. The following officers were elected: President, E. L. Latimer; Vice President, B. G Worth; General Freight and Passenger Agent, G. H. Smith; General Manager and Secretary, J. R. Nolan, and Treasurer, W. P. Toomer.

## RAILROAD CONSTRUCTION.
### Incorporations, Surveys, Etc.

**Airlie, Toledo & Nashville.**—Charles Kennedy, W. H. Rich, W. M. Toner, A. L. Porter and C. B. Crosne have incorporated this company in Oregon to construct a road from Airlie, Polk County, to a point on Rock Creek in Benton County, Ore. The capital stock is $150,000.

**Albany, Florida & Northern.**—Trains will begin running on this road from Albany north to Cordele, Ga., 31 miles, in a few weeks. All the track has been laid, and only about five miles remains to be ballasted to finish the work. The line will be operated in close connection with the Columbus Southern.

**Altoona & Wopsononock.**—The contract for the unfinished portion of the roadbed has been let to Charles Y. McAteer, Philadelphia, Pa., who has already begun the work with a large force of men and will push it rapidly to completion. It is the intention of the company to have the road open for freight and passenger traffic by May, as far as Wopsononock, Pa., a summer resort, situated on the highest point of the Allegheny range, being 2,752 ft. above tide water at Sandy Hook. W. T. Forsythe, Altoona, Pa., is Chief Engineer.

**Atlantic & North Carolina.**—The legislature of North Carolina has passed a bill prepared by the board of directors of this company, authorizing the construction of an extension from the western terminus at Goldsboro, N. C., west, to a point on the Cape Fear & Yadkin Valley road.

**Baltimore & Ohio.**—The work of building the extension from Morgantown, W. Va., North to Uniontown, Pa., 20 miles, is reported to be progressing. The grading is nearly completed, and rails are laid a good part of the way. It is proposed to have the link completed by July 1.

**Bangor & Aroostook.**—This company is being formed under the general railroad law of Maine, but is applying to the state legislature for additional legislation that no road shall be built within 15 miles of the route. The proposed line is from a connection with the Bangor & Katahdin Iron Works railroad, now leased to the Bangor & Piscataquis at Brownville Junction to Presque Isle in Aroostook County. This line is to be 135 miles in length, and passes through Sherman, Patten, Crystal, Island Falls, Dyer Brook, Oakfield, New Limerick, Houlton, Littleton, Monticello, Bridgewater, Blaine, Mars Hill, Easton and Presque Isle, all in Aroostook County. A second line proposed is from Dyer Brook to Ashland, 40 miles.

**Baraga & Watersweet.**—This company has filed its articles of incorporation in Michigan to build a road between Baraga and Watersweet. The capital stock is $1,000,000, and the principal office will be at Baraga, Mich.

**Birmingham & Jones Valley.**—The contract was recently awarded for completing this line between Birmingham, Ala., and Avondale, one of its suburbs. The line will extend through Jones Valley and will be in operation in May. C. M. Boulden, of Birmingham, is President.

**Camden & Alexandria.**—The road is now being operated for the first 10 miles from Camden, Ark., south. Most of the grading has been completed to El Dorado, 32 miles southeast of Camden. The contractors for the grading are York, Wood & Loonan, of Camden. The company is laying the track with its own forces, and the 10 miles at present completed has been laid since the beginning of the year. The maximum grade is 52 ft. per mile, and the maximum curvature three degrees, compensated. Some surveying has been done south of El Dorado, and it is proposed to continue the line from that point to Alexandria; but nothing definite has been determined upon concerning the further extension of the line, and it is not likely that any work will be done beyond El Dorado before the summer.

**Chattanooga, Kentucky & Chicago.**—Application has been made in Tennessee for a charter incorporating this company. The incorporators are C. E. James, J. R. Whitman, A. M. Womble, Franklin Harris and H. H. Webster. The purpose of the company is to build a road from Chattanooga to the northern boundary of Macon County, Tenn. The line is to form part of a proposed new route from Chattanooga to Bowling Green, Ky.

**Chicago, Milwaukee & St. Paul.**—A route has been surveyed from Mankato northwest to Farmington, Minn., and it is stated that it is intended to extend the Wells branch to that point.

**Colorado & Northeastern.**—The articles of incorporation were filed in Colorado recently, the capital stock being $100,000. As recently noted, a preliminary survey has been made for part of the line. The road is to extend through the counties of Pueblo, Otero, Bent, Kiowa, Cheyenne and Kit Carson. It will begin at Pueblo, running easterly in the Arkansas valley and south of the Arkansas River to a point near Rocky Ford, in Otero County, where it will cross the Arkansas River, continuing in a northeasterly direction to Kit Carson and Beloit to the eastern state line of Colorado.

**Danville & East Tennessee.**—Part of the line from Bristol, Tenn., east was recently placed under contract and the next section of the line to be let will be the first 50 miles from Danville, Va., the eastern terminus, west. Surveys have been made for about 30 miles from Danville. J. W. Coffin, No. 503 Fifth avenue, New York City, is President of the Interstate Construction Co., which has the grading and tracklaying on the first 26 miles from Bristol to Damascus, Va. The construction company has sublet the work to James H. Edwards & Co., whose office is at the corner of Brook avenue and 150th street, New York City. The contractors have about 260 men at work near Bristol at present. The work is rather difficult, about half of it being rock. The maximum grade is 70 ft. per mile, and the maximum curves are 10 degrees. This is the only part of the line that has been finally located.

**Delaware, Lackawanna & Western.**—Reports are printed in several of the local papers to the effect that several parties of engineers of this company have been engaged for the past month making a survey for an extension to Rochester, N. Y. The survey is said to have been completed as far as Scottsville.

**Delaware Valley.**—Arrangements are being made to begin the construction work on this road in the spring between Port Jervis, N. Y., and Stroudsburg, Pa. The line is about 40 miles long and has been partly surveyed. J. Poole, New York City, is President, and Jacob Newburger, also of New York, is Vice-President.

**Duluth, Mesabi & Northern.**—The articles of incorporation were filed in Minnesota last week, the capital stock being reported as $5,000,000. The proposed road is described as to extend from some point on St. Louis bay or river, near Duluth, in a northerly direction to the Northern boundary of Minnesota. The road is a reorganization of the Lake Superior & Northwestern.

**Emporium & Rich Valley.**—The company was chartered in Pennsylvania Feb. 18. It is to build a road from the line of the Philadelphia & Erie in Emporium, Cameron County, to the mouth of Elk Run, on the Driftwood branch of the Sinnemahoning Creek, in Shippen County. The length of the road is 10 miles. The capital stock is $100,000. C. B. Howard, Emporium, is President.

**Fairhaven & Southern.**—The connection between this road and the division in British Columbia, called the New Westminster Southern, was made on Feb. 15 at the international boundary near the town of Blaine, Wash., the occurrence being made the occasion of a celebration participated in by many citizens from New Westminster and Seattle and Puget Sound.

**Flovilla & Indian Springs.**—Most of the work on this short Georgia road has been completed except the ballasting, which is now being done. The rolling stock has been ordered and the line will be placed in operation when the cars arrive. The road is built through Butts County, and extends from Flovilla to Indian Springs, a popular local suburban resort. W. F. Smith is President and M. A. Lindsay is General Manager.

**Fort Gibson, Tahlequah & Great Northeastern.**—The preliminary survey is about completed for the first 25 miles of this road, from Rogers, Ark., on the St. Louis & San Francisco, southwest through Bentonville and Siloam Springs, Ark. The line is to be continued through Ft. Gibson to Tahlequah, Indian Ter. The length of the road to Tahlequah, the capital of the Cherokee Nation, will be about 100 miles. The surveys are being made by S. B. Robinson. A good line has been located with an easy grade, and it is not expected that the maximum will exceed 60 ft. If the work on the road is not delayed the company will let contracts for grading in April.

**Great Northern.**—Contracts have been let to Foley Bros. & Guthrie, of St. Paul, for building a northern extension of the Sauk Centre & Northern branch from Eagle Bend to Wadena, Minn., the southern terminus of the Wadena & Park Rapids road. Work will be commenced next week.

**Gualala River.**—This company has been incorporated in California, with a capital stock of $1,500,000, of which $500,000 has been subscribed. The object of the company is to construct a road from Bowen's Landing, in Mendocino County, southward through Gualala County and along the Gualala River, through Mendocino and Sonoma counties to Cazadero, with branch lines to Point Arena, to the source of Pepperwood Creek, to the source of Gualala Creek, to Pile Creek and along Buckeye Creek and the Wheatfield fork of the Gualala River. The estimated length of the road, with branches, is 103 miles.

**Hoosac Tunnel & Wilmington.**—A town meeting will be held at Wilmington, Vt., this week, at which it is expected that the proposed bonds of $35,000 will be voted this company with little opposition, to aid the extension from Readsboro north through Whittingham and Deerfield to Wilmington, a distance of about 10 miles. Whittingham will be asked to vote $10,000 for the extension.

**Houston Belt.**—The directors have recently authorized the issue of new mortgage bonds to the amount of $500,000 for the construction and equipment of the line. The directors have been able to secure assignments of most of the right of way on the route through Houston, Tex.

**Jacksonville Mining & Mfg. Co.**—C. D. Martin & Co., Tredegar, Ala., are the contractors on the short road being built by this company through Tredegar north to Iron Mountain, a distance of nine miles.

**Lancaster, Oxford & Southern.**—The part of the old Peach Bottom road between Kings Bridge and the Susquehanna, in Lancaster County, Pa., is being changed to standard gauge. The survey is about finished for the extension north to Quarryville, five miles, and from Oxford, the eastern terminus, southeast to Singerly, Md., on the Baltimore & Ohio, a distance of about 20 miles. When the line between Quarryville and Lancaster and between Kings Bridge and Oxford has been changed to standard gauge and the extensions built, a connection will be completed between the Philadelphia & Reading and the Baltimore & Ohio.

**Louisville, New Albany & Chicago.**—Work on the branch to the Clay County coal mines from the main line at Bainbridge, Ind., south is being pushed vigorously. Twelve miles of the grading and bridging is completed and six miles of track has been laid.

**Macon & Atlantic.**—The contractors have about 200 men laying track from Bruton, Ga., a point on the Wrightsville & Tenille, north of Dublin, and they are laying about a mile and a quarter of track a day. About 25 miles will be laid this month through Stillmore to the Ogoochee River, Bullock County. Six hundred men and 500 teams are reported to be employed by the contractors between the Ogoochee and Savannah. The long trestle at Soffkee, which is said to be 10,000 ft. long, has been completed, and the iron drawbridge across the Ocmulgee River is being erected.

**Macon & Northeastern.**—This company has been formed by the Georgia, Carolina & Northern and Georgia, Southern & Florida to build a road from Elberton, Ga., on the former road, near its crossing of the Savannah River, to Macon, Ga., an estimated distance of 100 miles. The articles of incorporation will be filed in a few days. The road will parallel for some distance the recently acquired line of the Richmond & Danville, the Covington & Macon. The names of John M. Robinson and R. C. Hoffman, of the Seaboard & Roanoke system; W. B. Sparks, of the Georgia Southern & Florida; W. W. Collins and George W. Gustin, of Georgia, are given as organizers of the new company.

**Mobile & Girard.**—The contractors recently began to lay track on the extension from Troy, Ala., south to Pensacola Junction. Nearly all the grading has been finished for 50 miles south of Troy and little work remains to be done which will hinder the progress of tracklaying.

**Mohawk & St. Lawrence.**—The surveys have been completed for this road, the St. Lawrence extension of the New York Central & Hudson River. The contracts will be let in a few weeks, and it is proposed to begin work as soon as possible. The southern terminus of the line will be at Rome, N. Y., and it will extend from that town north through Hawkinsville, Carthage, Watertown and Clayton, with a branch to Gouverneur. Nearly 150 miles will be constructed. The route is along the bank of the old Black River Canal to the town of Northwestern. It will closely follow the course of the canal to a point near the village of Hawkinsville, and from there it will follow the Black River to Carthage, passing through Lyons Falls and Lowville. From Carthage one branch will extend to Gouverneur and the other to Watertown, Chaumont and Clayton. The distance from Carthage to Clayton is about 45 miles. The cost of the new road will be about $6,000,000.

**Morristown & Cumberland Gap.**—The grading has been practically completed between Morristown, Tenn., and Floyds, on the Knoxville, Cumberland Gap and Louisville. Nearly all the trestles have been erected and some track has also been laid. The balance of the rails will be laid at once, and the entire line will be opened for traffic in a few weeks. It is about 45 miles long and passes through Beans Station, Tait Springs, Rutledge, Lea's Spring and Blaines, connecting the East Tennessee, Virginia & Georgia with the Louisville & Nashville, and giving a new connection at Cumberland Gap from the northwest to the southeast. The most important bridge on the line is across the Holston River, and is of iron with stone piers. Allison, Shafer & Co., of Louisville, are the contractors. Charles J. Allison, of Morristown, is Chief Engineer.

**New Roads.**—A survey is being made from Shendun, Va., north to a connection with the Baltimore & Ohio near Caves Station, Va.

Arrangements are now being made for a road from Crosswicks, Burlington County, N. J., to the Amboy branch of the Pennsylvania Railroad. Nearly enough money has already been pledged to complete the line as proposed.

**New York, Philadelphia & Chicago.**—The surveys are being made for this road from Franklin west to Clearfield, Pa., a distance of about 50 miles. The engineers have reached a point near Clearfield, and about one-third of the right of way has been secured. The line will pass through Clarion, Brookville, DuBois and Curwensville. The maximum grade is 52 ft. per mile, and the curvature five degrees. Charles Miller, Franklin, is President, and George B. Hamilton is Chief Engineer.

**Norfolk & Western.**—One of the officers is given as the authority for the following statement of the status of work on the extensions: On the Ohio extension 116 miles have been graded. The total length of this branch will be 171 miles. About the middle of March tracklaying will be commenced at both ends, and 80 miles of track will be laid as rapidly as possible. Track is now being laid on short sections from Elkhorn and from the Ohio end. The rains have, of course, interfered with the work, but everything is going forward as rapidly as possible. On the North Carolina extension track is laid to the Great Outburst. The contract for eight additional miles on this branch has been let. Sixteen miles are now in operation. The total length will be 45 miles. Contracts for the remainder of the work have not been let. On the Clinch Valley extension a slide at one of the tunnels hinders work, and until this is removed no tracklaying will be done. It is expected that the tracklaying will then be pushed to Norton, where connection will be made with the Louisville & Nashville, which will give a direct communication with Cumberland Gap.

**Northern Pacific.**—The new line from Centralia west to Montesano, Wash., 42 miles, was open for traffic Feb. 16, but no regular freight trains have been put on. At present the construction trains will carry freight. The stations are Harlam Junction, Elma and Montesano.

**Nova Scotia Midland.**—Eighteen miles of this road has been graded from New Glasgow, N. S., and the balance of the work to the Atlantic Coast, in Suyborn County, is being rapidly completed. The length of the road will be 60 miles, and it is expected that the entire distance will be in operation early in October. The road will be laid with 67-lb. rails, which have been purchased. The rolling stock and machinery will soon be ordered from firms in the United States. The company owns iron lands along the route of its road and expects to have the mines open this fall. The government has granted a subsidy for the coal and iron lands on the line of the road, and several furnaces are already being built in anticipation of the completion of the line. Herbert Richmond, 52 Broadway, New York City, is President, and H. W. Lester, New Glasgow, N. S., General Manager.

**Ohio River.**—At a meeting of the Ohio River Improvement Co., held at Baltimore, Md., last week, it was decided to extend this road from Huntington, W. Va., the present terminus, west to Kenova, a new town built at the point where the Ohio extension of the Norfolk & Western crosses the Ohio River. The distance is 11 miles, and the line will cross the Twelve Pole and Guyandotte rivers. The extension will connect the Ohio River road with the Norfolk & Western system.

**Peterborough, Sudbury & Sault Ste. Marie.**—This company proposes to build a road from Trenton or Coburg, on Lake Ontario, to Peterborough, and thence via Lakefield, Buckhorn, Minden, Huntsville and Sudbury to Sault Ste. Marie. The distance to Sudbury is about 270 miles and to Sault Ste. Marie it is about 450 miles. E. H. D. Hall, 116 Hunter street, Peterborough, Ont., is secretary.

**Philadelphia Elevated.**—The Mayor has signed the bill, recently passed by select and common councils authorizing the construction of an elevated road on Market street, in Philadelphia. The bill provides that the franchise for building the line be awarded to the company offering the greatest compensation to the city.

**Pickens, Arvon & Western.**—A charter has been granted in West Virginia to this company with a subscribed capital of $50,000, to build a line from Pickens, Randolph County, to the headwaters of the Little Kanawha and Holly Rivers, at Arvon. The road is an independent extension of the West Virginia & Pittsburgh road.

**Pittsburgh & Moon Run.**—The contracts will be let in a few days for building this road between Groveton on the Pittsburgh & Lake Erie and Pennington, Pa., a distance of six miles. The surveys have been com-

pleted. The grades average 67 ft. per mile and the curvature, 14 degrees. The capital stock, $100,000, has been subscribed and paid in. N. F. Sanford, Chartiers, Pa., is President.

**Pittsburgh, Ohio Valley & Cincinnati.**—The engineers are retracing and restaking the line from Mattamoris westerly to Marietta, Ohio, preparatory to resuming work March 1. Contracts for building that part of the line will soon be let, and the work is to be pushed so that the road may reach Marietta by June 1.

**Pittsburgh, Shenango & Lake Erie.**—The extension from Osgood north to Lake Erie was completed to Conneautville, Pa., last week. The ballasting has not yet been done, and the extension will not be operated beyond Hartstown for some time. About three miles of track has been laid from the connection with the New York, Chicago & St. Louis near Girard south, leaving about 17 miles yet to complete.

**Pittsburgh & Southern.**—This new company was chartered in West Virginia last week with a capital stock of $1,000,000, and proposes to build a road from Blacksville, W. Va., south via Manington to Clarksburg, where it will connect with the West Virginia & Pittsburgh. The incorporators are: Charles W. Cowan, J. H. Furbie and A. N. Pritchard, of Manington; T. M. Jackson, of Clarksburg, and Thompson Strosnider, of Blacksville. The company is chartered to open a large body of coal land, through which it will pass, the land being owned largely in the East. The length of the road is about 67 miles.

**Ravenswood, Spencer & Glenville.**—The bridge over the Little Kanawha River in West Virginia, at Burnsville, has been completed, and tracklaying is progressing on to the north. The grading of the line is almost finished, and ties are distributed all the way to Spencer, about 20 miles from the Ohio River.

**Rio Grande Western.**—The narrow gauge Sevier Valley branch was built last year from Thistle on the main line south 60 miles to Manti, Utah, and the survey was continued beyond that point to Marysville, about a similar distance further south. Preparations are now being made to resume the grading on the extension as soon as the weather will permit grading, and it is expected that the track will be laid this year as far as Marysville.

**Roanoke Southern.**—The company has track laid at present to within three miles of Martinsville, Va., from Winston-Salem, N. C. As soon as the iron bridge across Smith River to Martinsville can be completed regular train service will be extended to that point. The last contract between Martinsville and Roanoke, Va., was let last week to Allen, Moseley, Davis & Co., now of Rocky Mount, Va., to be completed by August. When this is completed the road will be opened to Roanoke. As soon as possible the locating party of engineers will start from Winston and survey the proposed southern extension. The iron bridges, three in number, will be placed during this month, and the whole work rapidly pushed to completion. The maximum grade is 80 ft. on tangents, and the same compensated on curves, which do not exceed 10 degrees.

**Silver Creek & Dunkirk.**—Work was begun this week on the new road in New York, the Lake Shore & Michigan Southern's new short cut between the two points named. The contractors are getting their plant on the ground and will push the work of construction.

**Toledo & Ohio Central.**—At a meeting of the stockholders, held this week, it was voted to increase the capital stock to $3,000,000, and to confirm the action of the directors in guaranteeing the interest on the bonds of the Kanawha & Michigan road.

**Westerly & Jewett City.**—Application will probably be made very soon to the Connecticut state legislature for a charter for this company. It has already been incorporated in Rhode Island. It is to begin at Westerly, R. I., at the junction of Rhode Island and Connecticut, on the ocean, extend north through the manufacturing village of Voluntown, Conn., on the border of the two states, 20 miles, to its northern terminus at Jewett City, Conn. The route for it has been surveyed twice. Its cost will be about $200,000.

**Western New York & Pennsylvania.**—The survey now being made for the proposed extension from Oil City, the present terminus of the line, extends southwest via Franklin to a point near Jackson Centre, Pa., a distance of probably 45 miles. The company expects to let the contract in a few months and to complete the road during the present year. Only preliminary work has been done on the line, however, and no date has yet been determined upon for beginning work.

**Wilcox & Rocky Run.**—The company was incorporated in Pennsylvania Feb. 19, to build a road from Wilcox, Elk County, Pa., to a connection with the New York, Lake Erie & Western Coal & Railroad Company's road near Hutchins, McKean County. The distance is nine miles and the capital stock is $25,000. Irving Schultz, Wilcox, is President.

## GENERAL RAILROAD NEWS.

**Baltimore & Ohio.**—Earnings and expenses for January, 1891, as compared with January, 1890 (January, 1891, approximated), are as follows: Earnings, 1890, $1,924,758; 1891, $1,884,526; decrease, $40,232; operating expenses, 1890, $1,360,635; 1891, $1,416,813; increase, $56,278; net earnings, 1890, $564,123; 1891, $467,613; increase of $896,510.

**Boston & Albany.**—The report to the Massachusetts Railroad Commissioners for the quarter ended Dec. 31 gives gross earnings as $2,374,036; a decrease of $4,241; net earnings, $748,485; decrease, $47,259. Net income, deducting charges, $29,643; a decrease of $72,356.

**Chicago & Alton.**—The annual report of the company shows that the gross earnings from traffic and interest on temporary investments of surplus during the year 1890 were $7,339,250. The disbursements for operating expenses, taxes, rent of leased lines, interest on bonds and dividends, were $7,258,133, leaving a balance of $81,117. The income account, including a balance of $2,715,890 on hand Dec. 31, 1889, shows a total income of $10,055,140, with total disbursements of $7,631,631, leaving a balance of $2,423,509. The actual gross earnings were $7,065,753, a decrease of $450,863 as compared with the years previous; operating expenses, $4,382,001, a decrease of $189,734; net earnings, $2,683,751, a decrease of $261,128. President Blackstone devotes part of his report to a discussion of the railroad situation. Concerning the agreement for a division of competitive traffic that was entered into July 30 by the Southwestern Missouri River lines, he says: "This agreement was continued in force during the remainder of the year, but the several practices which it was designed to prevent were not discontinued, and our hopes based upon it fell very far short of complete realization." Deploring the tendency of state legislation against railroads, he asserts: "In a group of nine Western States west of Indiana, in which about one-third of the whole number of miles of railroads in the United States is located, we find, according to the official reports of the several railroad commissions of these states for 1889, that more than four-fifths of all the railroads in this group of states failed to earn any dividends for the shareholders in that year, and that capital stock representing such non-dividend earning roads amounts to more than $1,000,000,000. And yet," Mr. Blackstone adds, "it appears that in the legislature of each state in this group there are one or more bills under consideration designed to still further reduce railroad earnings."

**Covington & Macon.**—The bondholders seem to have concluded an agreement with the Richmond & Danville last week transferring their title and control of the road to that company. The bonds have been in default and have been principally owned in Baltimore. The bondholders were represented by a committee, of which Alexander Brown was Chairman. The terms upon which the transfer was made have not been made public. The Seaboard & Roanoke was known to have offered to purchase the bonds, and it is reported that its failure to secure the road will result in building a new line to Macon.

**Kansas City & Southern.**—The road has been advertised for sale by the Farmers' Loan & Trust Co. of New York. The sale will take place in Kansas City, April 21, and is ordered on account of the non-payment of bonds due Jan. 1, 1891. The road is the property of John I. Blair, of New Jersey.

**Louisville, New Albany & Chicago.**—William S. Alley, a stockholder, has applied to the United States Circuit Court at Chicago for a Receiver for this road, charging the management with fraud, and claiming that $2,800,000 of new mortgage bonds have been issued of which no accounting has been made. Various other charges of financial mismanagement are made. The suit has been referred to a Master in Chancery for an immediate report. The annual meeting occurs next month.

**Meherrin Valley.**—G. M. Serpell, of Norfolk, Va., who purchased this road three years ago from the Receiver of the National Bank, of Norfolk, since which time it has been operated by him, has sold the property to the Seaboard & Roanoke and Petersburg roads jointly. The Meherrin Valley connects with the Seaboard & Roanoke at Margarettsville, N. C., and with the Petersburg at Hicksford, Va. It is 17 miles long.

**Oregon Improvement Co.**—The company offers to its shareholders the privilege to subscribe to $4,000,000 of its five per cent. consolidated gold bonds, the proceeds of which are to be used to pay off the floating indebtedness and complete the construction and improvements now under way. It is also intended by the company to avail itself of a provision in its first mortgage by which the bonds may be redeemed at 105. This will be done before July 1. The company also proposes to retire the remainder of its outstanding preferred stock, amounting to $700,000. Thus only two classes of securities will be left outstanding, namely, the consolidated mortgage bonds and the common stock.

**Union Pacific.**—The following is the preliminary statement of earnings for December and the year to Dec. 31:

| *December.* | 1890. | 1889. | Inc. or Dec. |
|---|---|---|---|
| Mileage | 7,598 | 7,490 | I. 108 |
| Gross earnings | $3,449,574 | $3,572,809 | D. $123,234 |
| Oper. expen | 2,680,680 | 2,557,423 | I. 123,257 |
| Net earn | 768,893 | 1,015,385 | D. 246,492 |
| *Twelve months to Dec. 31:* | | | |
| Av. miles operated | 7,555 | 7,389 | I. 165 |
| Gross earnings | $43,049,248 | $39,669,600 | I. $3,379,648 |
| Oper. expen | 29,343,961 | 24,516,751 | I. 4,827,210 |
| Net earn | 13,705,286 | 15,152,484 | D. 1,447,562 |

From the earnings of the year there has been withdrawn, for the time being, the sum of $253,233, claimed by the company on account of fast mail service rendered by it for the government between November, 1889, and June, 1890, and which has not yet been finally allowed by the Postmaster General.

## TRAFFIC.

### Chicago Traffic Matters.

CHICAGO, Feb. 18, 1891.

The Commissioners of the Western Traffic Association are in session this week, considering matters of a routine nature principally. The outlook for a satisfactory settlement of existing differences in the Southwest is much more promising than a week ago, and all parties express the determination to stand by the existing association agreements.

President Manvel and Vice-President Springer, of the Atchison, returned from their Western trip Feb. 15, and have been in conference with the chairman of the associations, respecting matters in which that company is interested.

Representatives of the Jacksonville Southeastern have been in the city this week in conference with the Atchison officials and the Chairman, and as a result of the conference Chairman Finley has decided to extend the date when the tickets of that line were to be dishonored from the 18th to the 23d inst., pending negotiations which, it is expected, will result in a satisfactory settlement of the question.

The Western Freight Association at its meeting last week decided to amalgamate the two divisions, as noted in my dispatch of the 11th, placing the whole territory in charge of Chairman Midgley. This action is in line with the work of the meeting in New York, but for the present the Western Freight Association will work under the old agreement, members of both this and the Western Traffic Association being at liberty to take such matters before the Commissioners of the latter as are covered by that agreement. The subjects on the call were summarily disposed of, a large number being referred to committees for report at the March meeting. Several propositions for changes in rates were acted upon adversely, and the general disposition was not to make any changes. The Sioux City & Northern applied for membership.

The Central Traffic Association has agreed to a special commodity rate on railroad spikes, car loads, Pittsburgh to Chicago, of 15 cents per 100 lbs., effective Feb. 23. An attempt was made by the east and west lines to reduce rates on manufactured iron from Pittsburgh to Chicago 2¼ cents and to reduce tariffs from Mahoning Valley points in proportion. The Pennsylvania and the lines in the Chicago and Ohio River Association opposed this in the interest of the Southern iron manufacturers, and no result was reached owing to the absence of several interested lines.

An effort is being made to close all freighthouses in Chicago at 5:30 o'clock and at 4 p. m. on Saturdays in summer and 5 o'clock in winter.

The Rock Island has commenced a suit against the Union Pacific to enforce the contract with the latter company in regard to the Omaha bridge, and it has been transferred from the state court to the Federal court, and will take the same course substantially that the St. Paul suit is taking.

As was anticipated, traffic in all directions is very light. This is one of the reasons given by the Atchison for not being able to comply with the later orders of the Board of Apportionment.

Chairman Finley to-day authorized all lines interested to make a $7 round trip rate from Chicago to St. Louis, beginning on Saturday. The Jacksonville Southeastern made this rate to a party of St. Louis bank clerks, and at once the Alton met the rate. Then the Jacksonville line came down to $6.

### Traffic Notes.

A car service association has been organized at Birmingham, Ala., with W. H. McClintock as Manager. It will begin business in a few weeks.

Owing to the heavy travel the Pennsylvania and the Atlantic Coast line will run the New York and Florida special daily, except Sunday, instead of triweekly, beginning Feb. 23.

The "Soo" line announced on Feb. 16 an advance in freight rates from Boston to St. Paul and Minneapolis to $1.20 (first-class) from the $1.05 rate heretofore existing, the new rate taking effect Feb. 27. This puts Boston and New York on an equal footing.

It is reported that the Cleveland, Cincinnati, Chicago & St. Louis has made an arrangement with the Toledo, Columbus & Cincinnati, by which through trains will be put on between Cincinnati and Toledo via Kenton. The distance though is 208 miles, seven miles longer than the line of the Cincinnati, Hamilton & Dayton.

The National Transportation Association recommends the adoption by all commercial bodies represented thereby of the following memorial to the Senate and House of Representatives of the United States. . . .

*Resolved*, That the Senate and House of Representatives are hereby earnestly requested to take such measures as may in their judgment seem proper to compel the carriers of the United States to furnish all shippers a uniform bill of lading in which the common law liability only of said carriers shall be expressed and the early establishment of a uniform classification, the rules and conditions whereof shall be just and reasonable.

*Resolved*, That the co-operation of the Interstate Commerce Commission in the establishment of these principles is urgently requested.

### Switching Charges in Iowa.

Judge Shiras, in the United States Court at Dubuque, Ia., has rendered a decision in which he holds that the state, and not the United States district courts, have jurisdiction of cases growing out of switching charges fixed by the State Railroad Commissioners. The case decided grew out of a refusal on the part of the Chicago, Milwaukee & St. Paul to switch cars from other lines to the Fengler lime kilns at Eagle Point at the price fixed by the Railroad Commission. This sends the case back to the state court, which decided against the railroad company; but according to this decision it can be appealed to the Supreme Court of the United States directly from the State Court. The opinion was concurred in by Judge Caldwell, of the Circuit Court.

### Coal Rates to Lake Erie.

Usually in February there begins an agitation of several months duration regarding relative coal rates from the Pittsburgh and the Hocking Valley districts, and usually the agitation reaches such a climax that a ferocious war in rates seems inevitable. But this year the subject has not yet been broached. Neither from the Pittsburgh nor from the Hocking Valley people come any intimation that a yearly revision of the coal schedule is desirable. Apparently both fields are satisfied. Last year the contest between them was more determined than ever. It ended, finally, in a reduction of ten cents in the differential previously accorded the Hocking Valley coal, the differential allowed being five cents per ton instead of 15. When the agreement was reached the impression prevailed that before the season ended hostilities would break out afresh, but to all appearances all parties to the agreement adhered to its provisions with fidelity. Business was good, and all the roads were so closely engaged that no concession in rates was thought of. The anticipations of coal men are that business will be equally brisk this coming season.—*Cleveland Leader.*

### East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Feb. 14, amounted to 71,490 tons, against 75,467 tons during the preceding week, a decrease of 3,977 tons, and, against 100,775 tons during the corresponding week of 1890, a decrease of 29,285 tons. The proportions carried by each road were:

| | Wk. to Feb. 14. | | Wk. to Feb. 7. | |
|---|---|---|---|---|
| | Tons. | P. C. | Tons. | P. C. |
| Michigan Central | 10,439 | 14.6 | 10,490 | 13.9 |
| Wabash | 4,113 | 5.8 | 4,628 | 6.1 |
| Lake Shore | 11,202 | 15.7 | 11,081 | 14.7 |
| Fort Wayne | 7,898 | 11.0 | 7,706 | 10.3 |
| Panhandle | 7,861 | 11.0 | 8,242 | 10.9 |
| Baltimore & Ohio | 4,578 | 6.4 | 4,861 | 6.4 |
| Chicago & Grand Trunk | 3,791 | 13.7 | 10,332 | 13.7 |
| Nickel-plate | 9,031 | 12.6 | 10,241 | 13.6 |
| Chicago & Erie | 6,577 | 9.2 | 7,836 | 10.4 |
| Total | 71,490 | 100.0 | 75,467 | 100.0 |

Of the above shipments 5,860 tons were flour, 31,573 tons grain, 4,530 tons millstuffs, 6,027 tons cured meats, 4,309 tons lard, 8,111 tons dressed beef, 991 tons butter, 992 tons hides, 97 tons wool and 4,526 tons lumber. The three Vanderbilt lines carried together 42.9 per cent., while the two Pennsylvania lines carried but 22.0 per cent.